MODERN PLASTICS

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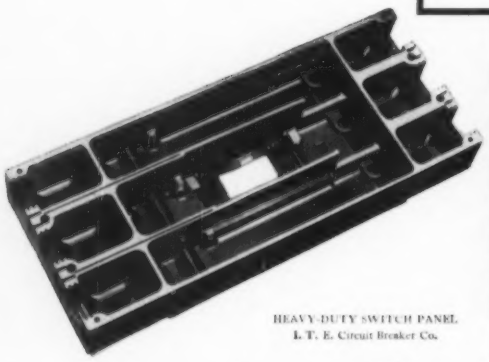
NOVEMBER 1952

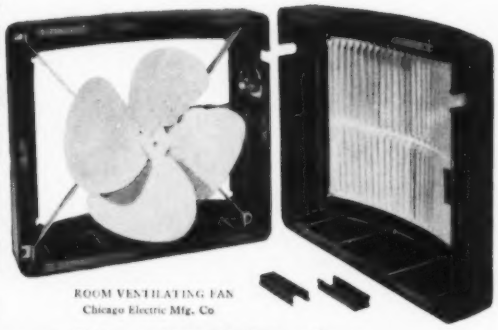
Why not think BIG when you plan on plastics?

TELEVISION CABINET
Motorola, Inc

POPCORN WARMER BASE
Buddy Boy Popcorn Co.



HEAVY-DUTY SWITCH PANEL
I. T. E. Circuit Breaker Co.



ROOM VENTILATING FAN
Chicago Electric Mfg. Co

...see your molder about big DUREZ pieces

If you have always limited your thinking on plastics to fairly small pieces, we invite you to consider them in a brand new light . . . as material for major units or components.

Bigger presses, improved techniques in custom molding, and the versatility of phenolics developed by Durez have greatly *enlarged* the utility of moldings in recent years.

Pieces weighing up to 40 pounds and more are now turned out, *ready for assembly*, at mass production speed. These range up to 15" x 18" x 36", and their size is determined only by the capacity of available presses. The larger the size, the greater is the economy available through elimination of many machining, assembly, and finishing operations.

In large and small moldings the inherent characteristics of Durez phenolics have won them an important place in industry. They mold to critical tolerances. They have outstanding electrical values and resistance to chemicals and to heat, plus impact strength and permanence of finish.

It will pay you to discuss your large projects with your custom molder. For specialized assistance, feel free to call on Durez technicians in your area.

Our monthly "Durez Plastics News" contains many useful ideas. May we place you on the list? Durez Plastics & Chemicals, Inc., 1211 Walck Road, North Tonawanda, New York.

PHENOLIC PLASTICS THAT FIT THE JOB

Catalin STYRENE is helping the home's most useful room to become the prettiest!

Today, kitchen remodeling and redecorating are household incentives, the country over! The desire, now, is to blend utilitarian values into an environment that relives the warmth of Colonial charm and hospitality! For such interesting planning, quality kitchen wares, molded of low-cost, structurally strong CATALIN STYRENE place gracious home-living on display. Thru their bright, easy-to-clean, gemlike colors and rich design, utility accessories such as canisters, bread bins, cake trays and catch-all baskets, pleasingly accent their convenient-to-reach efficient presence!

Items described herein are molded and marketed by Nu-Dell Plastics Corp., 2250 No. Pulaski Road, Chicago 39, Ill.

CATALIN CORPORATION OF AMERICA
ONE PARK AVENUE • NEW YORK 16, N. Y.

CATALIN

In addition to Styrene Molding Compounds, Catalin chemical products include a wide range of Urea, Phenolic, Cresylic, Resorcinol, Melamine and Styrene Resin formulations.

MODERN PLASTICS*

VOLUME 30 NOVEMBER 1952 NUMBER 3

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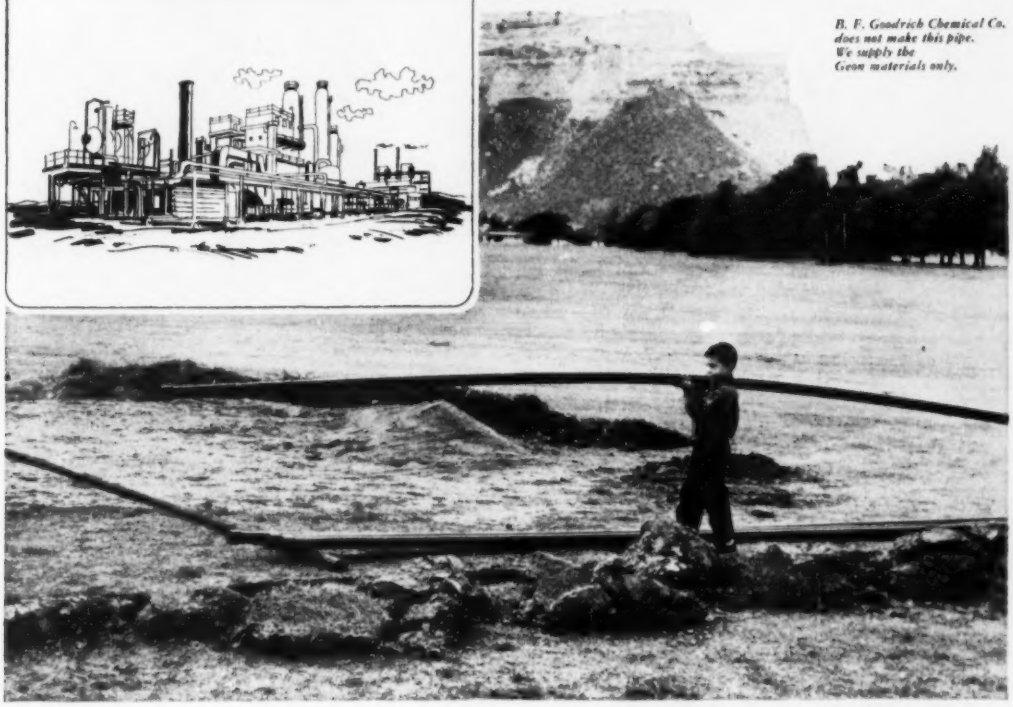
*Reg. U.S. Pat. Office

Another new development using

B. F. Goodrich Chemical *raw materials*



B. F. Goodrich Chemical Co. does not make this pipe. We supply the Geon materials only.

From a golf course—*plastic pipe idea!*

CORROSION-PROOF...RESISTS CHEMICALS...LIGHT WEIGHT

THIS rigid polyvinyl plastic pipe carried by the boy will serve for years in an underground irrigation system for a golf course. And—it's a pipe with many possible uses in chemical processing and other applications.

The manufacturer found every quality he needed in Geon polyvinyl chloride resin for this plastic pipe. It resists soil acids or alkalies and electrolysis—vital for sub-surface installations. It needs no protective coating or wrapping. All adding up to reduced maintenance costs.

There are more Geon advantages—and economies. Polyvinyl plastic pipe like this can be made rigid *or* flexible, useful for underground or overhead piping to carry gases or liquids.

It can be made light enough for a youngster to lift a length easily. Polyvinyl plastic pipe is four to six times lighter than steel pipe of equal length, diameter and wall thickness. Savings for you in freight and shipping costs, in handling, racking and stringing costs.

This plastic pipe is another example of how Geon materials help improve products and lower costs. For Geon materials can be made resistant to heat and cold, weather, aging, abrasion and most chemicals. Color range is wide. And they come as resins, latices or compounded plastics—can be extruded, molded, coated, cast or dipped. For helpful technical advice, please write Dept. GA-11, B. F. Goodrich Chemical Company, Rose Building, Cleveland 15, Ohio. Cable address: Goodchemco. In Canada: Kitchener, Ontario.

GEON RESINS • GOOD-RITE PLASTICIZERS . . . the ideal team to make products easier, better and more saleable.

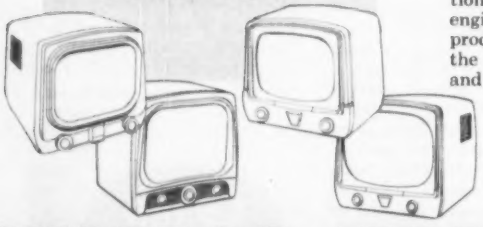
GEON polyvinyl materials • HYCAR American rubber • GOOD-RITE chemicals and plasticizers • HARMON organic colors

Again—

Motorola

CHOOSES CHICAGO MOLDED PLASTICS

FOR 4 NEW CABINETS



These four brand new models . . . molded of a sturdy phenolic material in rich mahogany with handsome metallic trim . . . are unquestioned style leaders in the new Motorola line. They're big ones, too. The two 21-inch models measure 22½" x 21½" x 21" and weigh 29 lbs. each. The other two are almost as big. And we're turning out hundreds of them every day.

We have molded many different styles and sizes of radio and TV cabinets for Motorola during the past several years. It's rather conclusive evidence, we believe, that Motorola is well sold on plastic cabinets . . . and, specifically, on Chicago Molded Plastics.

Of course, Motorola is just one example. There are dozens of others . . . top names in industry . . . who, year after year, choose Chicago Molded as their primary source of supply. And, why not? They find here a rare combination of experience (more than 32 years of it), top-flight engineers, and the most modern facilities for quantity production of even the largest parts made. It adds up to the best in molded plastics . . . efficiently, intelligently, and economically produced.

Next time you have a job that calls for plastics, talk it over with a Chicago Molded engineer. There's no obligation . . . and you'll thank us for suggesting it. Just write, wire or phone.

CHICAGO MOLDED PRODUCTS CORPORATION

CUSTOM MOLDERS OF ALL *Plastics*

1046 NORTH KOLMAR AVENUE • CHICAGO 51, ILLINOIS

EDITORIAL

The Simple Days Are Gone

The subject matter of lead feature articles in our past few issues points up a trend in plastics industry expansion that is particularly healthy in these times of high production.

This is the trend toward a more horizontal technology of plastics at molder and processor level, and even, indeed, at the level of the industrial end user.

As fields for plastics application expand and new ones open up, related factors of specific properties and economics make necessary a range of plastics materials and a variety of fabrication methods the like of which could not have been imagined five years ago. This condition is bringing about a more general acquaintanceship with new resins and new techniques than would be noted in a period of short supply and ready markets.

This trend is just beginning. Take styrene monomer, copolymerize it with each of half-a-dozen other monomers, then take these copolymers in turn and alloy them with polymers of styrene or with other polymers or with each other, and you run into literally hundreds of new materials, each with special properties, some with decided economic advantages, and all requiring specialized knowledge for proper use.

Or take the epoxies, the silicones, the fluorocarbons, and amalgamate them with low-cost thermosets such as phenolics and ureas, and you open up complete new possibilities of application never before economically possible. And here again special engineering knowledge and new fabrication technology must be developed for their proper use.

Or take the whole field of reinforced plastics with an ever-widening variety of resins available for low pressure application, and with new types of reinforcement constantly under development. Here in spite of tons of literature and huge research, the engineering knowledge is yet infinitesimal in proportion to need.

All industrial management and all industrial technologists and all teachers of science and all governmental research authorities are exercised about the present and probable future shortage of trained chemists and physicists.

MODERN PLASTICS shares that worry, but is even more exercised about the apparent lack of enthusiasm for the absorption of increased technical knowledge on the part of laymen who are concerned with plastics! We come up against this constantly in our reader's service inquiries, in correspondence, and in field contact.

The simple days are gone. The plastics industry and plastics technology are getting more complicated by the minute. There are no longer quick and easy answers—because such answers could very well be wrong.

Today no business man nor engineer can afford to stack literature on new technology and await his obvious need of it to read it. No one can afford to delay acquiring knowledge of new developments until he is forced to do so by competition.

By the same token, bigger sales are going to be made from now on by companies and by men who have built a reputation for knowing the latest technology.

The month-to-month continuing study of the pages of the industrial press and the literature of the material and equipment manufacturers and the careful analysis and cataloging of new information from these sources and from papers presented at technical conferences will pay off tomorrow. For those who do not recognize that the simple days are gone, there'll be no pay-off!

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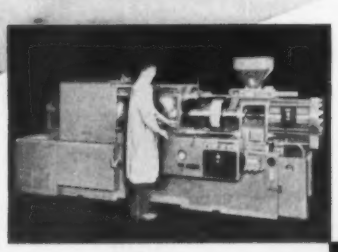
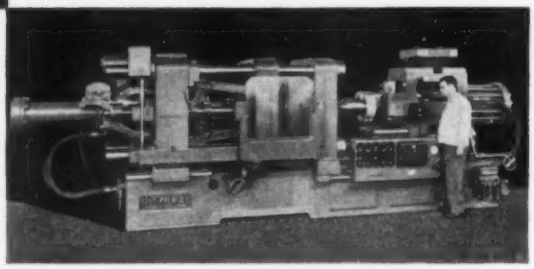
IT'S WISE to Standardize ON "REEDS"

Leading molders throughout the world rely on "REEDS" for injection molding of all thermoplastic materials. They know that standardizing on Reed-Prentice Injection machines saves on operating expenses, maintenance costs and downtime.

In the wide range of "REEDS" — from 2 to 200 oz. — there's a dependable model for every molding job. Get the full story on the complete line by sending for Bulletin No. 32.



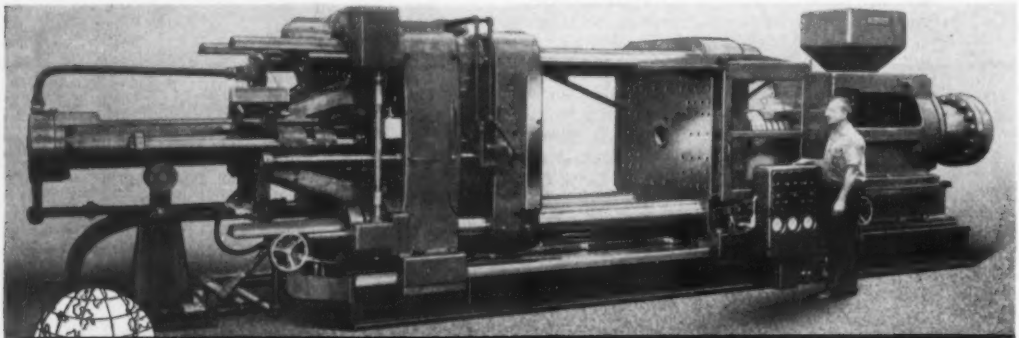
10D-8 OZ.



600T-32 OZ.

Specifications	4 oz.	8 oz.	12 oz.	16 oz.	24 oz.	32 oz.	200 oz.
Die locking pressure, tons	125	275	275	400	600	600	1500
Rated Casting area, sq. in.	50	125	125	150	300	300	700
Mold opens	8"	10¼"	10¼"	16"	24"	24"	36"
Max. die space	12"	16"	16"	24"	28"	28"	40"
Size of die plates	16x21"	21x25"	21x25"	40x45"	45x54"	45x54"	60x72"
Weight, lbs.	9700	12,850	16,250	31,500	45,100	46,100	92,000

1500T-200 OZ.



THE WORLD'S LARGEST MANUFACTURERS OF INJECTION MOLDING MACHINES

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Syracuse ..... J. F. Owens Machinery Co.
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INJECTION MACHINES

REED-PRENTICE CORP.

WORCESTER MASS., U.S.A.

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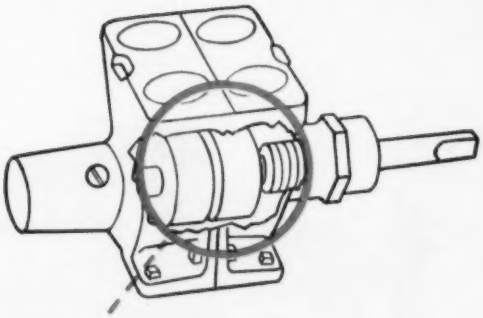
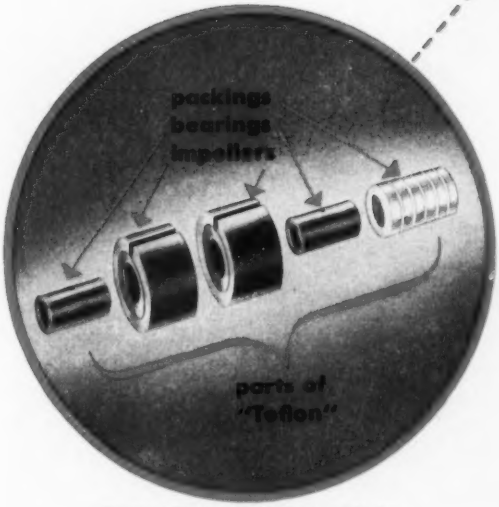


Pump parts of Du Pont "TEFLON"



Parts of Du Pont "Teflon" made for Eco Engineering Co., Newark, N. J., by U. S. Gasket Co., Camden, N. J.

eliminate erosive pitting... mechanical seizure... thermal-shock

In designing their "Allchem" positive displacement chemical pump, Eco engineers wanted an inert, non-contaminating material for packings, bearings and impellers. The material had to resist galling and erosive pitting . . . eliminate mechanical seizure and thermal-shock breakage.

They found the answer for all three requirements in one material—Du Pont "Teflon"* tetrafluoroethylene resin. "Teflon" is inert to all chemicals except molten alkali metals and fluorine under extreme conditions. It has an extremely low coefficient of friction . . . bearings are self-lubricating. And "Teflon" is mechanically strong . . . impellers withstand high tangential loads.

Even when operated in acids, bearings of "Teflon" are not subject to erosive pitting. The impellers of filled "Teflon" won't gall, shrink, swell, crack, or harden. Packings withstand high pressures and temperatures. According to the manufacturer, the use of Du Pont "Teflon" made possible "—a chemically and biologically inert pump, suitable for the conveyance of a large range of fluid chemicals, in the widest viscosity ranges." And "Teflon" withstands steam or chemical sterilization.

Du Pont "Teflon" has a combination of chemical, electrical, thermal and mechanical properties available in no other single material. Perhaps it can help you improve or develop a product. For further information, write:

*REG. U. S. PAT. OFF.

E. I. du Pont de Nemours & Co. (Inc.)
Polychemicals Department; District Offices:
350 Fifth Avenue, New York 1, N. Y.
7 S. Dearborn Street, Chicago 3, Ill.
845 E. 60th Street, Los Angeles 1, Calif.

DU PONT
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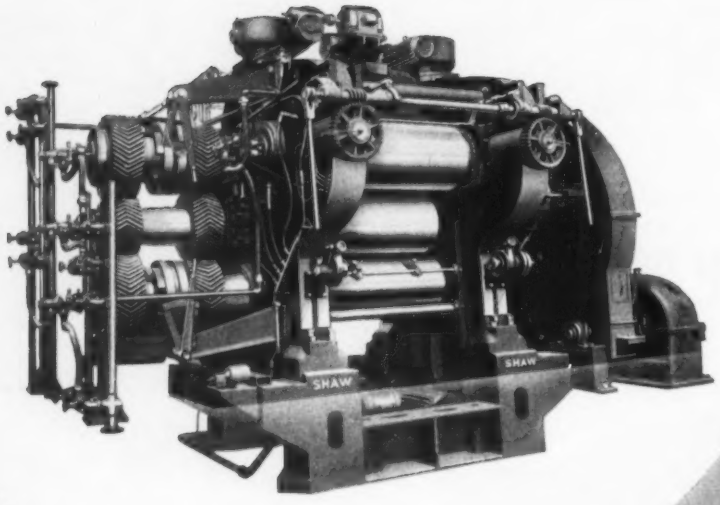
150th Anniversary
Better Things for Better Living
...through Chemistry
Polychemicals
DEPARTMENT
PLASTICS • CHEMICALS



The latest technical developments are incorporated in the SHAW range of precision calenders. The machine illustrated is one of their latest 68" x 24" 4-Bowl Even and Friction Speed Calenders. Fitted with individual motor drives to the adjusting screws of the top and bottom rolls. Roll bearings are flood lubricated. The nip setting on the top bowl of vertical stack is maintained by a hydraulic jacking system.
Full details sent on request. State size of machine required.

Industry's headquarters for the best in plastics and rubber machinery.

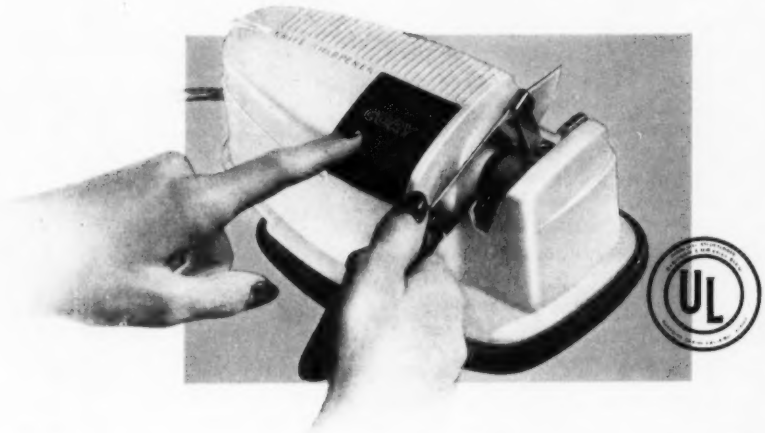
SHAW *calenders*

FRANCIS SHAW AND COMPANY LIMITED MANCHESTER 11 ENGLAND

1950

A CONTINUING SUCCESS STORY

MANUFACTURERS BUILD CONFIDENCE AND SALES WITH CELANESE* ACETATE



One of the many UL approved electrical products using Celanese flame-resistant acetate plastic is the Cory Knife Sharpener. This has been a year-after-year story of confidence in the consistent quality and selling properties that acetate delivers: high impact strength for electrical housings, high speed moldability, wide color range, flame resistance, and excellent form retention.

Why not duplicate Cory's success with acetate . . . ask your Celanese representative how you can build up your product with one of the specially formulated acetate molding powders. Or write: Celanese Corporation of America, Plastics Division, Dept. 101K, 180 Madison Avenue, New York 16, N. Y. In Canada, Canadian Chemical & Cellulose Company, Ltd., Montreal and Toronto.

Celanese*

*Reg. U. S. Pat. Off. Acetate PLASTICS

new HANKSCRAFT VAPOR-MASTER

1 ADJUSTMENT PLATE

INSUROK LAMINATE

Replacing a three-piece assembly, this plate is economically punched from an INSUROK laminate. Retains its insulating properties under repeated cycles of moisture and heat.

2 BASE

MOLDED PHENOLIC

This molded phenolic base, in replacing porcelain, eliminated water leakage, breakage, and excessive weight. Holds dimensions more closely. Molders marvel at its thin walls and deep draws.

3 COVER

MOLDED PHENOLIC

Molded from a phenolic plastic that possesses the high impact strength and light weight needed for this cover. It is capable of withstanding constant exposure to moisture and high temperatures.

4 TUBE

MOLDED FABRIC-FILLED MELAMINE

To withstand alternating cycles of boiling and cooling, a macerated cotton melamine was used. This material has high heat resistance, low water absorption, and high arc resistance.

5 INSULATING DISC

INSUROK MELAMINE LAMINATE

This punched INSUROK laminate provides high strength, rigidity, and heat resistance. Its resistance to arc tracking and its high dielectric strength prevent short circuiting.

6 CAP

MOLDED PHENOLIC

Warpage is eliminated in this cap by compression molding it from a heat-resistant phenolic which has low moisture absorption. Its high impact strength prevents breakage.

7 HANDLE

MOLDED PHENOLIC

This compression-molded, phenolic handle easily supports the 8½-pound load through two screws. It also acts as a good heat insulator—keeping the hand grip comfortable to the touch.

redesigned for plastics

RICHARDSON
PROVIDES A
complete plastics service
ON ALL SEVEN
PLASTICS PARTS

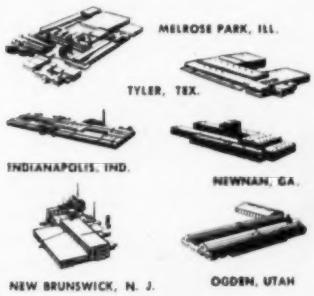
This Hankscraft "Vapor-Master," formerly made of porcelain, was heavy, cumbersome, and difficult to assemble. Breakage was also a problem. Hankscraft engineers decided to redesign the unit for plastics.

Because The Richardson Company renders a complete plastics service—from materials development through design, molding, laminating, and fabrication—they were selected to handle the job. Richardson and Hankscraft engineers worked closely on the design of the parts, selection of materials, and production methods. They created an attractive, sturdy, all-plastic "Vapor-Master," weighing only 3 pounds.

Difficult plastics problems, like those of the Hankscraft Company, are being solved every day by the highly skilled Richardson engineering staff. The Richardson Company offers a complete single-source plastics service embracing molding, laminating, and fabricating. Write for information today.

INSUROK ®
MOLDED & LAMINATED PLASTICS

Write for Illustrated INSUROK Folder



The RICHARDSON COMPANY
FOUNDED 1858—LOCKLAND, OHIO
2789 Lake St., Melrose Park, Illinois (Chicago District)

But Boss! Where can I get a plastic film that meets these specs ?

CLOPAY VINYL PLASTICS are custom-made to fit your specific need. Clopay facilities and compounding techniques assure controlled uniformity with material characteristics of the widest versatility — ideal for application in the manufacture of all types of consumer and industrial goods.

CHECK CLOPAY FOR:

CAST VINYL FILM.... A product of high stability formulated to combine physical and chemical properties tailored to meet the most exacting requirements. Ideal for electrical insulations, non-toxic applications, pressure-sensitive tapes, moisture and water barriers and other special uses embracing rigid specifications.

COATED PRODUCTS.... Thermosetting and Thermoplastic coatings applied to any paper or fabric. For all protective and decorative uses.

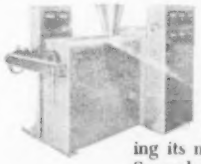
CLOPANE.... Extruded, clear, protective packaging film is competitive in price with standard packaging materials but with all the superior advantages of Vinyl.

NON-CORROSIVE PIPE.... Extruded pipe including rigid unplasticized Polyvinyl Chloride resists alkalis and most acids. A valuable contribution to the petroleum, mining and chemical industries. Available in U. S. Standard Pipe sizes and special sizes to order.

INDUSTRIAL PRODUCTS DIVISION

CLOPAY *corporation*

CLOPAY SQUARE, CINCINNATI 14, OHIO • Phone: DUnbar 4800
New York: 386 Fourth Ave., Room 608 • Phone: Murray Hill 3-8066



Paradoxical as it may seem at first glance, each and every one of these plastic items has, at some time during its manufacture, passed through a versatile MPM extruder. Several of them came from the extruder ready to use without further processing; for others, being extruded was just the initial step. Let's get down to cases . . .

1. COVERED WIRE Using suitable cross-head dies, MPM extruders are unexcelled for covering wire with one or more thermoplastics. Famous WD-1 nylon covered assault wire is extruded on MPMs at better than 2,100 feet per minute.

2. WINDOW CHANNELING Wider use is being made every day of weather resistant, dimensionally true extruded channeling for storm window frames, frames for showcase sliding doors.

3. OUTDOOR DRAIN PIPE The outdoor drain pipe is transfer molded, but the materials from which it is made are mixed in an MPM extruder before being fed into the transfer press.

4. MULTICOLOR BEADS An unusual extrusion job done on MPM equipment are these acrylic beads; the halves of each bead can be of different colors. Two-color pierced rod is extruded and then reduced to beads on a centerless grinder.

mpm

EXTRUDERS HELP MAKE ALL THESE PRODUCTS

5. CLEAR ACETATE SHEET Enormous amounts of clear acetate sheet are produced in widths up to 48 inches and as thin as .001. Much of this extruded sheet is fabricated into transparent boxes and similar end products.

6. TOOL HANDLES Impact-resistant extruded rod is rapidly replacing wood as a material for screw driver and chisel handles. These plastic handles look better, last longer.

7. DISPLAY FORM Because they have smooth, non-snagging surfaces, these acrylic display legs are favored by hosiery dealers everywhere. The material is extruded as a tube and blown to shape while it is still hot.

8. RECORDING BELT MPM extruders have replaced less efficient machines formerly used to extrude recording belts as used with a new dictating machine. The resulting belts are low in cost, highly uniform and do not create excessive sound distortion.

9. AUTO SEAT COVERS Colorful, serviceable seat covers for automobiles, woven of extruded monofilaments, have captured the market almost completely. They are by far the best wearing, the best looking available.

These examples demonstrate the extreme flexibility of production possible with MPM extruders. This, plus a superior heat control system and solid corrosion resistant construction for all wearing parts should make MPM extruders first on your list for consideration whenever you have *anything* to extrude.

modern plastic machinery corp.

15 Union St., Lodi, N. J., U. S. A.
Cable Address: MODPLASEX

(West Coast Representative) 4113 W. Jefferson St., Los Angeles 16, Calif.

get in the swim for more sales...

MILMER 1 for mildew control in vinyls

Tubing or fabric coatings . . .
Insulation or film . . .

If it's made of vinyl, it will last longer with Monsanto Milmer 1. Make sure *now*, the vinyl you produce for next summer's market contains this key compound. Milmer 1 controls mildew, enables vinyls to resist attack by fungi, thereby reducing disfiguration, embrittlement or cracking.

And it's easy to use. It can be incorporated readily into tubing, free film or coated fabric. Properly applied, it will not cause crocking, bleeding or blooming. It is non-toxic and permanent.

For more information about Milmer 1 in vinyls—or a listing of military specifications including or requiring Milmer 1—call or write MONSANTO CHEMICAL COMPANY, *Organic Chemicals Division, 800 North Twelfth Blvd., St. Louis 1, Missouri.*

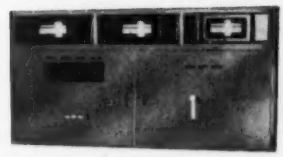
Milmer; Reg. U. S. Pat. Off.

MILMER 1

MONSANTO
CHEMICALS—PLASTICS

SERVING INDUSTRY...WHICH SERVES MANKIND

Three-zone temperature control



the SURE KEY to higher plastics production

the W-S 16 OUNCE HORIZONTAL MOLDING MACHINE

Experience has shown that the day-to-day shirt-sleeve jobs are done most economically on the intermediate size machines—notably the famous W-S 16 ounce Injection Molder.

There's more than size, however, behind the outstanding preference for this model. Consider, for example, a single machine in which *all* these features are offered:

- Extra long heating cylinder for increased plasticizing efficiency . . . COMPARE!
- Three-zone temperature control . . . COMPARE!
- Replaceable bronze bushings in cylinder and moving platens...COMPARE!
- Faster cycles with dual pressure controls . . . COMPARE!
- Hydraulic and electric safety controls . . . COMPARE!
- Special pumping unit . . . COMPARE!
- Remote control panel . . . COMPARE!

If *your* profits are coming in something less than the full measure, it will pay you handsomely to investigate this profit-booster NOW. Detailed literature and/or personal analysis without obligation.

W-S HYDRAULIC

HYDRAULIC MACHINERY DIVISION
150 Aldene Rd.
ROSELLE, NEW JERSEY

WATSON-STILLMAN
ESTABLISHED 1848

9-M-74

Foreign Sales Representatives: OMNI PRODUCTS CORP., 460 Fourth Ave., New York 16, N. Y.
Correspondents Throughout the World

MIDGET GRANULATOR CUTTER

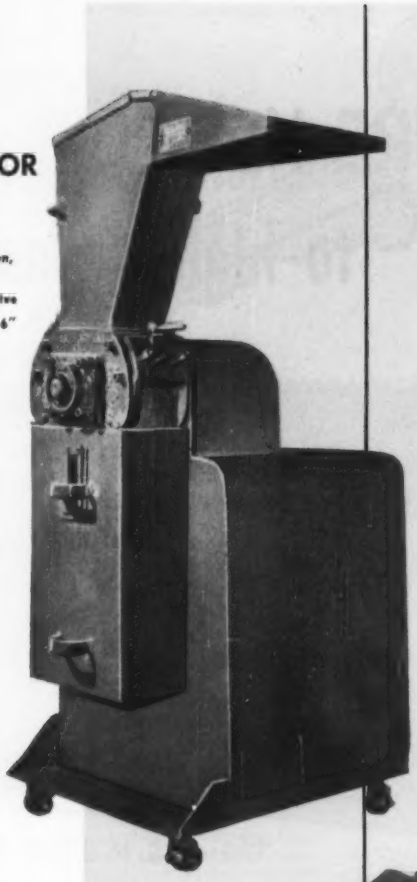
CAPACITY: 50-75 lbs. per hr., based on 5/16" screen, polystyrene scrap.

HORSEPOWER: 1—V-belt drive

THROAT OPENING: 5½" x 6"

FLOOR SPACE: 19" deep, 21" wide, 50" high

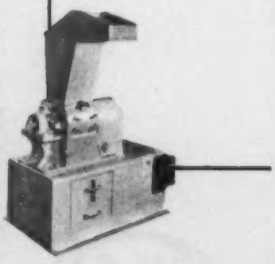
WEIGHT: 450 lbs.



SPECIAL DESIGN ADVANTAGES

- Newly designed hopper and table for more efficient feeding.
- Specially designed for operation alongside molding machines for immediate regrinding of scrap materials.
- Handles gates, sprues, etc., from ¼" to ½" sectional thickness, dependent on type material.

Your grinder source for every individual plastic material cutting requirement and capacity (50 to 3,000 lbs. per hr.)—Ball & Jewell, machine tool builders since 1865, have always paced the plastics industry. Send us your requirement specifications.



Require A Larger Machine?

B & J LABORATORY "251"

Capacity rating, 150 lbs. per hr., 8" x 8" throat opening, engineered to cut large, thin section parts without pre-cutting.

Or any one of 9 larger size machines, up to 3,000 lbs. per hr. capacity, to meet your individual production capacity and specifications.

BALL & JEWELL, INC. *Leadership Through Continuous Engineering Improvements*

22 FRANKLIN STREET, BROOKLYN 22, NEW YORK

Want the right answer to your plastics problem?

You're on the right track to the right answer when you call in Kurz-Kasch first—one of the largest and most experienced moulders of thermosetting plastics in the country. All we need to help you is your inquiry on the plastic moulded part *you* need. And if you'll use this check list to prepare that inquiry, you'll be helping us to help you more quickly. Here it is:

- ☐ If you're in a hurry for a price, will an *approximate* price do? If so, please state. Most moulders are pretty fair at guessing, but hate to hang their hats on such guesswork.
- ☐ If it's a *firm* price you want we'll need a little more time. Average estimates cost us about $35.00 and there will probably be many requests ahead of yours. But your estimate will reach you sooner, and your prices will be more attractive, if you are *specific* and follow these rules:
- ☐ Be sure blueprints are legible.
- ☐ Relax tolerances wherever possible. (Circle those dimensions which *must* be held.)
- ☐ Advise how the part will be used and show its next assembly, if possible.
- ☐ State the material required if you know it. If not, give information on heat requirements, color, moisture and chemical resistance, impact, electrical or tensile requirements.
- ☐ How large a mould is required? What will be your ordering requirements? How many parts will you use per year? How many years do you estimate the item will be active?
- ☐ How much finishing is actually required on the part?

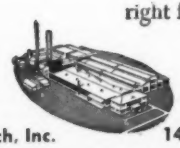
  Must the gate be ground flush?

  Will a tumble finish suffice for flash removal?

  Will the ultimate consumer actually see the part or any particular portion of the part?

  What finishing on this part will be done in your plant?
- ☐ If inserts are required, who is to furnish them? Send blueprints of inserts. Advise if plastic flash must be removed from inserts.
- ☐ Is a model or sample part available? Can we see it?
- ☐ Are suggestions for minor changes in design acceptable?

You'll get the right price for the plastic part that's right for the job in every way if you'll follow this check list. And if the part you need calls for thermosetting materials that can be compression, transfer or plunger moulded, you'll get the right supplier with the right facilities if you pick Kurz-Kasch. We're ready when you are.



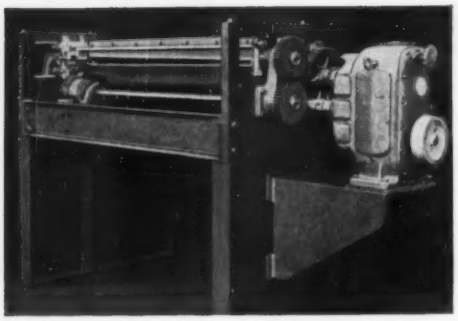
Kurz-Kasch, Inc. **1415 South Broadway • Dayton 1, Ohio**

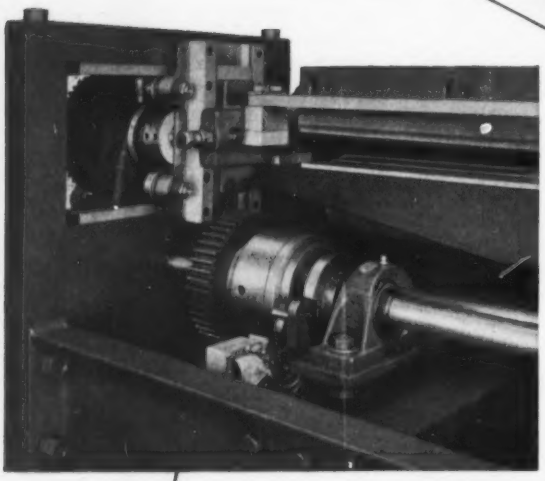
Branch Sales Offices: New York, *Lexington 2-6677* • Rochester, *Hillside 4352* Chicago, *Harrison 7-5473* • Detroit, *Trinity 3-7050* • Philadelphia, *Hilltop 6-6472* Dallas, Logan *1970* • Los Angeles, *Richmond 7-5384* • St. Louis, *Delmar 9577* • Toronto, *Riverdale 3511* • *Export Office:* 89 Broad Street, New York City, *Bowling Green 9-7751*

Kurz-Kasch

FOR OVER 36 YEARS PLANNERS AND MOULDERS IN PLASTICS

Egan





traveling shear

for sheeting any material

Patented by Frank W. Egan & Company, the Traveling Shear will cut any material from 4 inches to any length, in stepless increments, at web speeds up to 50 feet per minute.

Shear accelerates to web speed, provides scissor cutting action at speed, accelerates to avoid "humping" while upper blade is raised to clear web, then returns to start position.

Slitting attachment can be provided. The Traveling Shear gives accurate clean cutting of all "tough" materials.

Send for pamphlets on coating, treating and laminating

FRANK W. EGAN & COMPANY
Bound Brook, New Jersey

Designers and builders of: Treaters, Gummers, Laminators, Crepers, Air Dryers, Waxers, Coaters, Festooners, Saturators, Printers, Embossers, Winders and Special Machinery for Paper Converting.

Cable Address: "EGANCO"—BOUNDBROOK, N. J.

Noma chooses
NIXON V/L
RIGID VINYL SHEETING

The famous Noma line of bright, colorful Christmas lighting equipment contains outstanding examples of the fine effects which are achieved by VACUUM FORMING Nixon V/L Rigid Vinyl Sheeting.

After making a careful appraisal of the various sheet materials which were available, Noma Electric Corporation selected Nixon V/L Rigid Vinyl Sheeting for a number of important advantages . . .

superior deep drawing quality
accepts full color printing
dimensional stability • non-warping
excellent weather resistance

Vacuum forming and deep drawing of sheet plastics are constantly growing in importance as production techniques. Perhaps your product can be made from Nixon V/L Rigid Vinyl Sheeting by one of these methods—better . . . or cheaper . . . or both. Ask your Nixon Salesman. Or write to the office nearest you for details.

Figures, 19" and 30" sizes, are electrically illuminated

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"For Fine Custom Molding of Thermoplastics I Urge You to Cast Your Vote for Ideal"

EXPERIENCED plastics buyers don't need a fevered speech to make them aware of the quality custom molding done by Ideal . . . the quality is apparent all year 'round, year after year.

Ideal customers — be they Republicans, Democrats or Prohibitionists — know we don't make campaign pledges which we can't fill. When Ideal promises to deliver a certain number of pieces on a specified date, it's a sure bet you will get them on time.

Ideal wages a constant assault against the high-cost-of-buying. Every proven cost-cutting advance in molding technique quickly finds its way into Ideal's production set-up.

Our reputation for precision workmanship and low-cost has been firmly established by a history of thousands of injection molding jobs. Our facilities for mold design and building, production control, molding, assembling, finishing and allied operations are second to none.

This, in brief, is Ideal's platform: **To provide a custom service which gives you injection moldings of outstanding quality at prices reflecting the economies made possible by the efficiency of the world's largest custom molding operation.**

During election time, or at any other time, contracting for injection molding without examining Ideal's estimate isn't good business. Casting your ballot for Ideal often can save you time, trouble and needless expense. Write to A. C. Manovill, Vice Pres. in Charge of Sales. IDEAL PLASTICS CORPORATION, 184-10 Jamaica Ave., Hollis 7, N. Y. Phone: AXtel 7-7000. Mid-West Representative, Steel Mill Products Co., 176 West Adams St., Chicago 3, Ill. Phone: CEntral 6-5136.

Better Molded Plastics **Ideal** *for Industry & Home*

THE NEW PLIOVIC IS SIX-WAYS BETTER FOR CALENDERING

IF YOU produce calendered vinyl products – films, sheet, flooring – you'll find that the new PLIOVIC G90V resin gives you better results and higher quality end products for all these reasons:

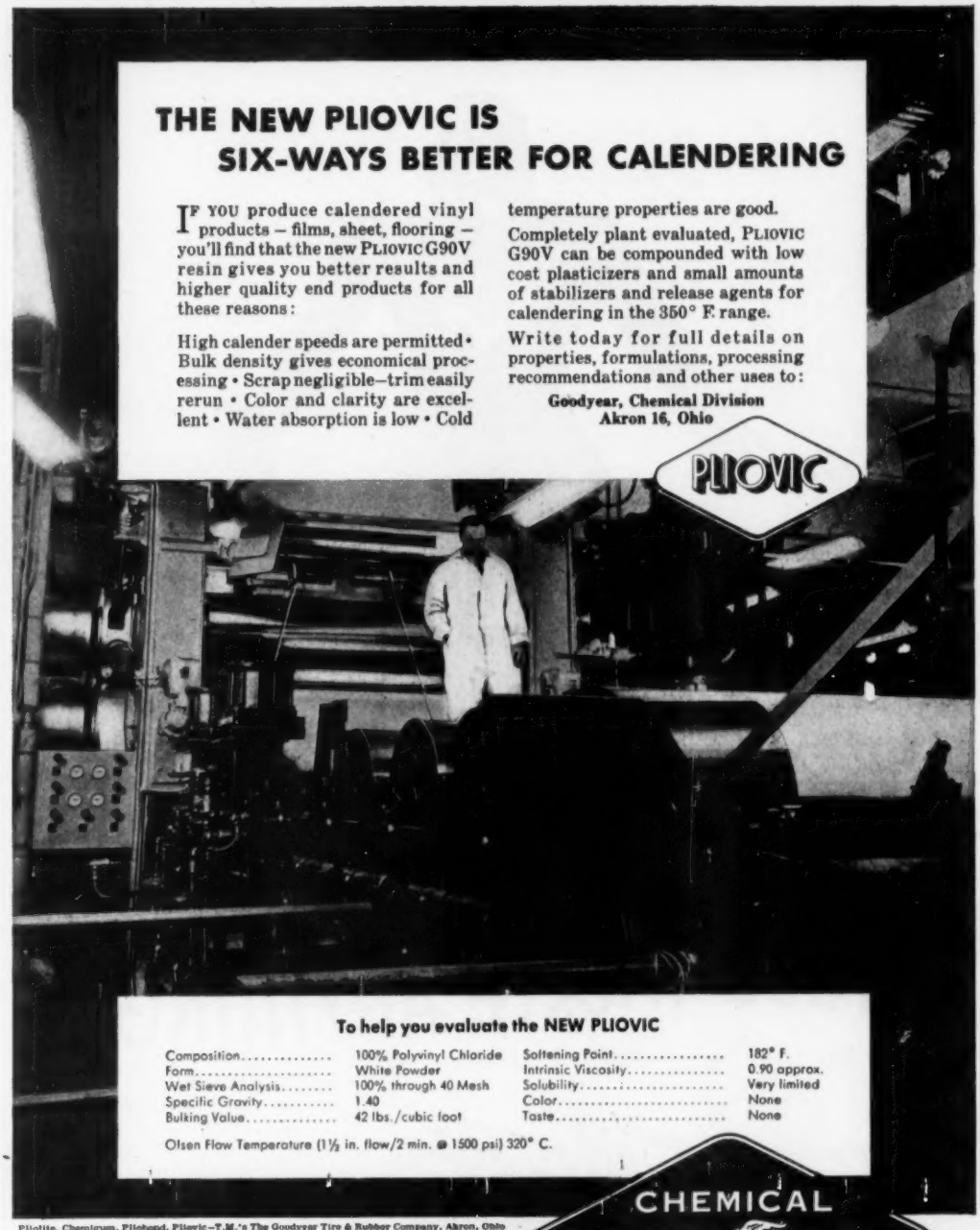
High calender speeds are permitted • Bulk density gives economical processing • Scrap negligible–trim easily rerun • Color and clarity are excellent • Water absorption is low • Cold temperature properties are good.

Completely plant evaluated, PLIOVIC G90V can be compounded with low cost plasticizers and small amounts of stabilizers and release agents for calendering in the 350° F. range.

Write today for full details on properties, formulations, processing recommendations and other uses to:

Goodyear, Chemical Division
Akron 16, Ohio

PLIOVIC



To help you evaluate the NEW PLIOVIC

Composition	100% Polyvinyl Chloride	Softening Point	182° F.
Form	White Powder	Intrinsic Viscosity	0.90 approx.
Wet Sieve Analysis	100% through 40 Mesh	Solubility	Very limited
Specific Gravity	1.40	Color	None
Bulking Value	42 lbs./cubic foot	Taste	None

Olsen Flow Temperature (1½ in. flow/2 min. @ 1500 psi) 320° C.

Pliolite, Chemigum, Pliobond, Pliovic–T.M.'s The Goodyear Tire & Rubber Company, Akron, Ohio

CHEMICAL
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MINNESOTA PLASTICS CORPORATION

INJECTION MOLDERS OF THERMOPLASTICS

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Our wide range of quality controlled phenolics embraces a combination of properties suitable to almost any application. To solve production problems... improve product performance... or add sales appeal...look to Plenco for the *right* plastic!
Phenolic thermosetting molding compounds are produced in general purpose grades and materials with special impact strength, heat resistance, or properties for deep drawing of large castings. Special purpose molding compounds in blacks, browns, mottles and other colors for particular molding requirements.
we supply the right combination
Phenolic synthetic resins are manufactured in dry, lump and finely ground particle sizes, or in solution adaptable to the application. Plenco engineers are available to help insure the success of a product through the stages from research to application.
PLENCO PHENOLICS
FOR BETTER PLASTIC PRODUCTS

For additional information on the forms, properties, and advantages of Plenco Phenolics, write to:

PLASTICS ENGINEERING COMPANY
Sheboygan, Wisconsin

H-P-M Plastic Molding Presses

75 Reflect of Press Building Experience!

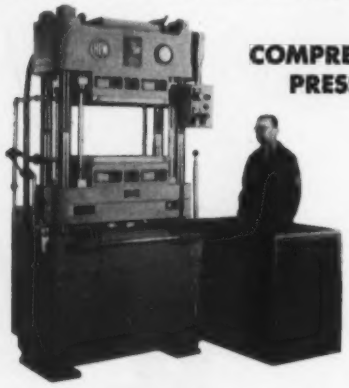
Right from the start . . . ever since plastics were considered a feasible commercial material . . . H-P-M has been designing and building molding machines for the plastics industry.

Today, H-P-M offers plastics machines for every job—injection, compression, transfer and laminating presses—machines designed to give molders larger capacities . . . faster cycles . . . fewer rejects . . . big savings in production costs.

These all-hydraulic machines are completely self-contained, being equipped with H-P-M engineered oil-hydraulic components (pumps, valves, controls), assuring undivided responsibility to the user.

H-P-M's 75 years of specialized experience in hydraulics stand ready to serve you.

CHOOSE THE METHOD BEST SUITED

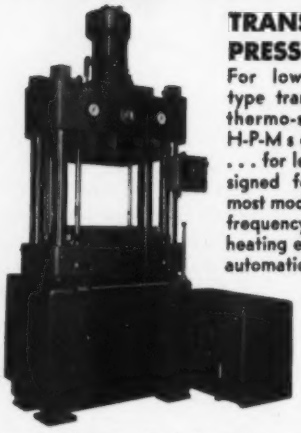


COMPRESSION PRESSES

Self-contained, H-P-M all-hydraulic compression molding presses are designed for economical mass production of thermo-setting parts. These high-speed, semi-automatic, production units offer many outstanding operating features—rapid mold closing, automatic slow-down, adjustable slow-close, breathing, rapid mold opening and automatic ejection. Write for Bulletin 4901.

	STOCK SIZES			
Capacity (tons)	100	200	300	500
Mold Size (max.)	24x18"	30x24"	36x30"	42x36"
Daylight (platen/head)	30"	36"	54"	54"
Ram Travel (max.)	15"	15"	18"	26"

NOTE—Larger sizes, up to 2500 tons capacity, built on special order.



TRANSFER PRESSES

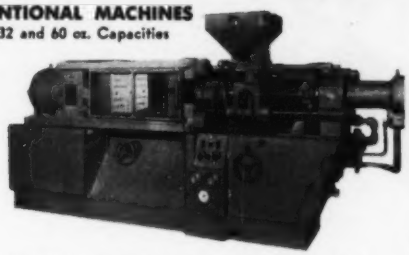
For low-cost, plunger-type transfer molding of thermo-setting plastics, H-P-M s do the job better . . . for less. They are designed for use with the most modern types of high frequency or steam preheating equipment. Semi-automatic control guarantees uniform results. Independent pressure control of both mold clamp and transfer plunger provides a wide range of applications. Write for Bulletin 4901.

	STOCK SIZES			
Mold Clamp (tons)	100	200	300	500
Transfer (tons)	35	50	80	113
Transfer Stroke	12"	12"	12"	16"
Mold size (max.)	24x18"	30x24"	36x30"	42x36"
Daylight (platen/head)	30"	36"	54"	54"
Mold Travel (max.)	15"	15"	18"	26"

NOTE—Larger sizes, up to 2500 tons capacity, built on special order.

INJECTION MACHINES

CONVENTIONAL MACHINES
9, 16, 32 and 60 oz. Capacities



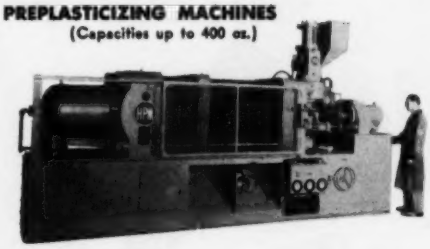
For molding thermoplastics you can't beat H-P-M s! From small parts to large parts weighing up to 60 ounces, there's an H-P-M stock size for every requirement. Check these features—direct electric heat for faster plasticization, accurate gravity-type material feed, positive mold sealing with all-hydraulic straight-line mold clamp. No toggles, links or cams to adjust. Exceptionally fast cycle. Quick, easy die set-up. All hydraulic components are readily accessible for easy maintenance. Write for Bulletin 5204.

STOCK SIZES

Capacity (oz./cycle)	9	16	32	60
Mold Size (max.)	14½x29"	19x33½"	25½x43"	40x68"
Mold Clamp (tons)	250	350	600	1200
*Daylight Opening (max.)	27"	32"	48"	60"
Mold Thickness (min.)	9"	12"	24"	24"
Clamp Travel (max.)	18"	20"	24"	36"

*Opening between die mounting surfaces, open position.

PREPLASTICIZING MACHINES
(Capacities up to 400 oz.)



H-P-M is first to offer injection molders the many advantages of preplasticizing—increased shot capacity . . . increased plasticizing rates . . . faster cycle time . . . strain free parts . . . less distortion . . . better color dispersion when dry coloring . . . lighter weight parts (up to 10% savings in weight). "Packaged" conversion units are available for H-P-M 9, 16 and 60 oz. machines now in the field. H-P-M preplasticizing machines are offered in capacities up to 400 ozs. See chart below. Write for Bulletin 5206

STOCK SIZES

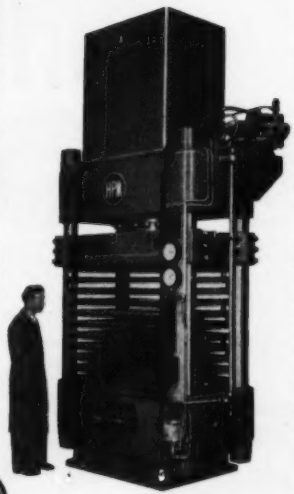
Model No.	Inj. Cap. (oz.)	Plasticizing (lb./hr.)	Clamp (tons)	Mold Space	Daylight	Clamp Travel
400-P-48	48	180	400	25½x36"	54"	30"

NOTE—Larger size machines, up to 400 oz. capacity with 3500-ton mold clamp, built on special order. Write for details.

TO YOUR NEEDS . . . THEN SELECT AN H-P-M PRESS TO DO THE JOB!

LAMINATING PRESSES

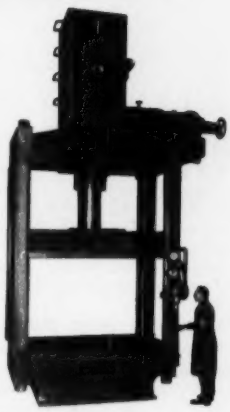
For compressing or curing laminated materials, H-P-M downward or upward acting hot plate presses are designed for maximum production output . . . manual or automatic operation as desired. Platen size, daylight, ram travel, speeds are designed to meet any production requirements. Each press is completely self-contained. Write stating requirements.



REINFORCED PLASTICS

H-P-M offers a complete line of high-speed, precision presses designed specifically for molding reinforced plastics.

Each press is self-contained. Semi-automatic control, fast closing, automatic slow-downs and accurate control of pressure are but a few of the outstanding features built into these H-P-M presses. For stock models, see chart below. Write for Bulletin 5107.



STOCK SIZES

Tonnage	50	100	150	200
Mold Size (max.)	36x30"	48x36"	60x48"	84x60"
Daylight	84"	84"	84"	84"
Stroke	48"	48"	48"	48"
Motor HP	5	5	7½	10

NOTE—Larger sizes built on special order.

75th YEAR HPM

THE HYDRAULIC PRESS MFG. COMPANY
MOUNT GILEAD, OHIO, U. S. A.

HAMILTON STANDARD DIV., UNITED AIRCRAFT CORP.,
U.S. leader in commercial propeller production, uses an average of four Formica parts per unit.

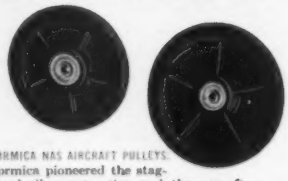
PLANE-MAKERS PROVE YOU CAN PROFIT WITH Formica

IN AVIATION, it's axiomatic: Aloft or on the ground, it's profitable to use Formica laminated plastics. Whether it's an electrical, electronic, chemical or mechanical problem . . . whether it involves sheets, tubes or rods, molded or postformed parts . . . the answer is Formica's specialized laminated plastics.

OUTSTANDING AMONG EXAMPLES of Formica's contribution to this thriving industry is the Hamilton Standard eight-blade dual-rotating Turbo-Hydromatic propeller assembly seen here. There are *nine different problems* in this 16-foot diameter mechanism, including terminal blocks, contact blocks, coil spools, switch housing, switch spacer and motor cable blocks.

But there's only one answer: ***It's Formica!***

Your products or processes may benefit by the same superiority that distinguishes Formica. It takes but a moment and costs you nothing to find out. Write today!



FORMICA NAS AIRCRAFT PULLEYS: Formica pioneered the staggered rib construction and the non-afterglow features . . . both valuable contributions to air safety. Formica is an approved, qualified source for AN219, AN220 and AN221 pulleys.

FORMICA GAUGE WOOD FOR FORMING DIES AND JIGS: A new phenolic impregnated compressed wood laminate. Has high impact strength and dimensional stability, yet weighs 40% less than aluminum. Can be fabricated quickly, easily and cheaply. Now in use by Chance Vought Aircraft Div. United Aircraft Corp., Bell Aircraft Corp. (Niagara Frontier Div.) and Twin Coach Co., Aircraft Div.

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laminated plastics headquarters since 1913

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CUSTOMERS have reason to choose NORTON

THOUGH IT LOOKS like a deadly ray-gun belonging to some cosmic TV hero, Hanau Engineering Company's hand-operated plastic alcohol blow-torch, with many parts molded by Norton, is actually a handy instrument used by many dentists. A few squeezes of the trigger directs a hot jet of flame for impression taking, setting-up teeth and a multitude of other jobs.

Engineering and molding such a torch of plastic, with minimum use of metal parts, presented challenging problems since its function hinges on compression of air within the cylinder and the leakproof design of the fuel chamber. Hanau Engineering, knowing Norton's wide reputation for *doing a job right*, brought it to us.

Their action was also guided by the knowledge that Norton, beyond putting the emphasis on flawless injection and compression molding, can be counted upon for on-time deliveries, sensible pricing, and courteous, cooperative service. These policies, rigidly adhered to, have converted many other users of custom molding into steady Norton customers.

Norton is interested in cultivating your molding business, too. Ask for a free survey of your next molding assignment by a Norton engineer from our nearest sales office. Norton Laboratories, Inc., Lockport, New York. Sales Offices: *New York—175 Fifth Avenue; Chicago—5221 Kimbark Avenue.*

NORTON *Laboratories, Inc.*

COMPRESSION AND INJECTION MOLDING

Aren't these your best customers?

3½-million families with BUY ON THEIR MINDS

IF YOU could hand-pick the best prospects for your merchandise, wouldn't you go looking for those men and women who are always asking, "What's new —what's better"? Well, those are *exactly* the kind of people who read Better Homes & Gardens!

For BH&G is the *only* one of the top-circulation magazines that is devoted *exclusively* to the interests of such readers. Only BH&G devotes every page of every issue to practical suggestions on what to do and what to BUY to make life easier, happier.

The result is—all 3½-million BH&G readers are bound to be your best prospects—and your best customers.

Isn't that something important to consider, next time your company buys advertising space?

BH&G BUYOLOGICAL BRIEFS

- *BH&G HAS JUST COMPLETED a plastics study among its more than 3½-million families—write to R. J. Tiernan, Meredith Publishing Company, Des Moines, Iowa for your FREE COPY.*
- *DEPT. STORE MERCHANDISING MGRS. vote BH&G first—as the magazine doing most to interest its readers in furnishing and equipping new and existing homes.*
- *IN 1951, RETAILERS RAN 1,656,007 lines of newspaper advertising tying in with BH&G articles and advertised products.*

MEREDITH PUBLISHING COMPANY, Des Moines, Iowa

From Giant Radomes That Protect Electronic Equipment—To Helmets For Construction Workers!

Pittsburgh Selectron Polyester Reinforcing Resins

Now Ready For a Thousand New Uses

PITTSBURGH SELECTRON Resins have opened numerous opportunities for vastly broadened product usefulness with greatly reduced manufacturing costs in many cases.

● **When combined** with suitable fillers—Fiberglass, cotton, rayon, nylon, felt, sisal, paper, etc.,—SELECTRON Resins have been used to mold products that are lighter than aluminum with strength-weight ratios and impact resistance surpassing those of any other known materials. They also provide unusual resistance to weather, sunlight, heat, abrasion and many chemicals.

● **Because of such unique** and distinctive advantages, SELECTRON Resins are today being used in a wide range of products. These are as different in size and shape as helmets for construction workers, manufactured by the Automatic Plastic Molding Company, of Berkeley, Calif., for the E. D. Bullard Company, of San Francisco, and giant radomes that protect electronic equipment in aircraft, produced by several large makers.

● **SELECTRON Resins** are of the thermo-setting type. They polymerize to form solids with or without heat and with or without pressure. Parts in which they are used can be molded either by hand lay-up, direct molding, continuous lamination or pre-forming. These resins can also be used without fillers for casting, potting and impregnating.

● **Because of their** unusual utility, more and more manufacturers are probing the seemingly endless possibilities of SELECTRON Resins. If you are designing a new product, or redesigning one you are now making, SELECTRON may help you make it lighter, stronger, more durable and, possibly, at lower cost. Call on us for *free* advisory service. We may be able to save you time and money.

Send For FREE Booklet!

● Write, wire or phone today for our new booklet containing description of SELECTRON Resins and explaining many of the ways in which they can be used. Pittsburgh Plate Glass Company, Selectron Products Division, 2000 Grant Building, Pittsburgh 19, Pa.

Just a few products in which Pittsburgh SELECTRON Resins are now used—

Aircraft structural parts
Radomes for electronic equipment
Life floats
Ballistic panels
Helmets
Boat hulls
Machinery housing and guards
Trays
Tote boxes
Food lockers
Garbage pails
Baskets for automatic dishwashers
Baskets for automatic washers
Wash tubs
Tool chests
Shipping containers
Instrument cases
Laundry hampers
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Fishing rods
Helmets
Sinks
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Traffic signs
Fluorescent light fixtures
Television cabinets
Loudspeaker housings
Gas meter housings
Structural panels for offices and homes
Door and transom lights
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Greenhouse panels
Skylighting
Molded chairs
Prefabricated houses and garages
Truck bodies

PITTSBURGH Selectron

PAINTS • GLASS • CHEMICALS • BRUSHES • PLASTICS

PITTSBURGH PLATE GLASS COMPANY

...another way of saying we can now produce bigger and bigger reinforced laminates for you.

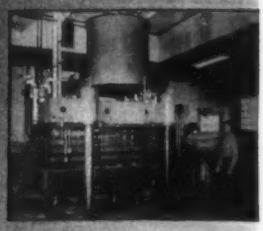
Our latest addition is this giant 60" x 150" x 55" press constructed to our design, with a capacity of over 1200 tons pressure.

Flanked below it are a 300 ton press, a 700 ton press which produces 4' x 9' panels up to ½" thick and our latest 48" horizontal to turn out boiler parts faster, at lower cost.

These are representative of the larger type of equipment we maintain for the production of reinforced plastic parts. In addition, we operate the largest battery of small presses in the country turning out hundreds of different products, made to the finest of tolerances.

Try us for size. Whether you want a part ½ inch small or 10 feet large, we are geared to handle it. And, if you have a problem, consult us. Our large staff of engineers and technicians is eager to help you.

Send for Illustrated Brochure



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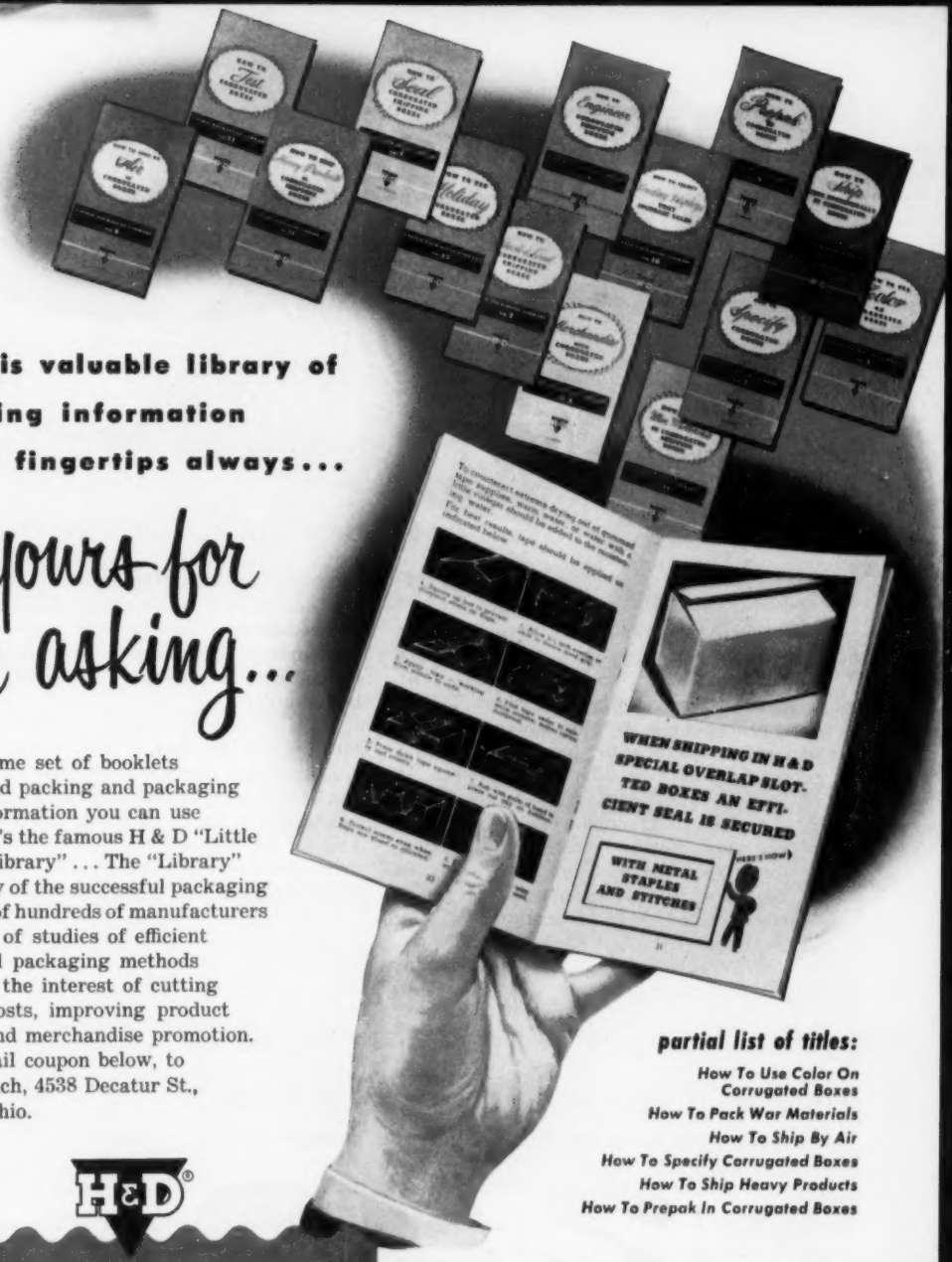

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This 14-volume set of booklets on corrugated packing and packaging contains information you can use every day. It's the famous H & D "Little Packaging Library" . . . The "Library" is a summary of the successful packaging experiences of hundreds of manufacturers . . . a series of studies of efficient shipping and packaging methods published in the interest of cutting packaging costs, improving product protection and merchandise promotion. Write, or mail coupon below, to Hinde & Dauch, 4538 Decatur St., Sandusky, Ohio.

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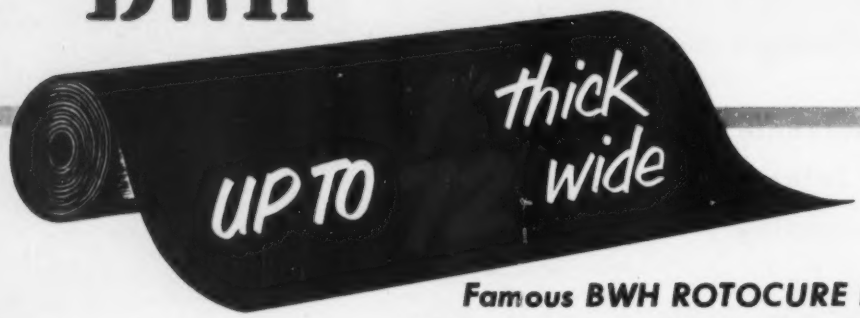
BWH ROTOCURE GIVES YOU



Famous BWH ROTOCURE Process Makes Economical Production Possible

Times are changing and so are processing techniques. Many products previously made only by flat press batch lamination can now be manufactured on a continuous basis on BWH's Rotocure machines at much lower cost than ever before. Rotocuring, long known in the rubber field, has been adapted for plastics. It has proven its economy and value on plastics jobs run for leading companies.

Rotocures run continuously. No time is lost opening, unloading, reloading and closing, as in the case with flat press lamination. The finished stock peels off an endless polished steel belt which gives it a high surface finish.

The Rotocure is a highly versatile machine with speed of operation varied as required. Temperatures as high as 340°F are available, with pressure up to 60 p.s.i. An embossed curing roll may be employed to produce an embossed product.

BWH Rotocures will weld a number of plies into a continuous sheet up to 1" thick.

Listed below are some of the materials which can be laminated by Rotocure. Many products in addition to those now being made, are suitable for manufacture on Rotocure machines. When production shifts from sheet processing in standard hydraulic press to continuous lamination on Rotocures, costs drop appreciably. Full particulars on the possibility of producing your product by continuous lamination on Rotocure machines will be supplied on request.

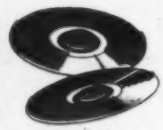
Production of these Products is cheaper on Rotocures

Can your costs be reduced by continuous lamination, too?

Desk and counter top material

Synthetic leather

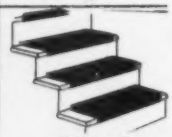
Shoe soling


Record preforms

Flooring

Luggage materials

Upholstery material


Stair treads

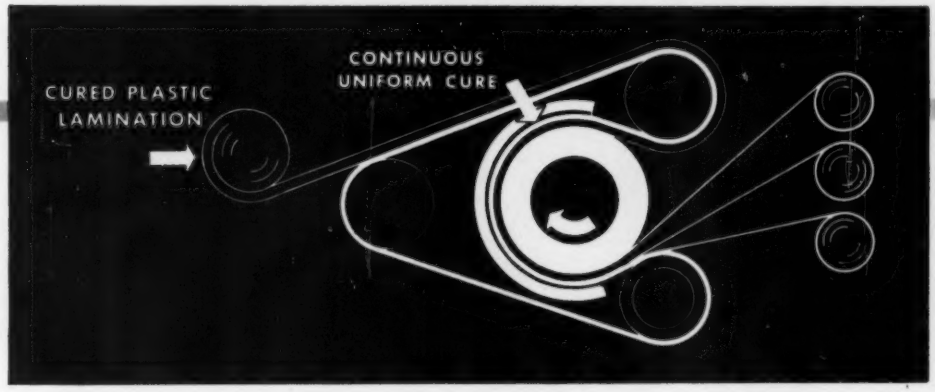
Partial list of materials laminated on BWH ROTOCURES

Flexible vinyls
Rigid vinyls
Polyesters
Copolymers

The above vinyls can also be laminated with the following materials:

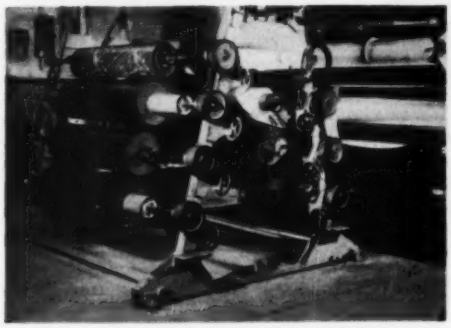
Natural and synthetic fibre cloths
Woven glass cloth
Plain and printed papers
Aluminum foil

CONTINUOUS LAMINATED PLASTICS



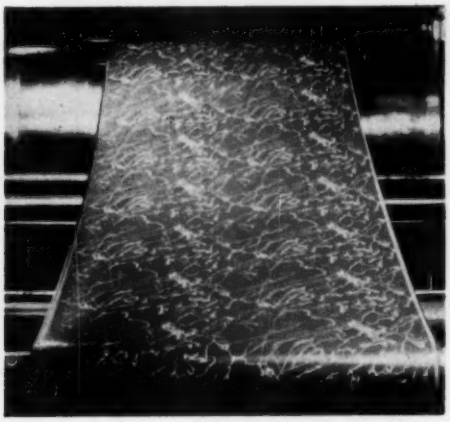
HOW THE ROTOCURE OPERATES

This schematic layout illustrates the principle of the Rotocure's operation. A line contact pressure of 100,000 pounds is exerted at the point where the pressure roll meets the curing roll, and pressure is maintained during the entire travel of the material on the curing roll by an endless steel belt. Heat is applied by the curing roll, as well as from the shoes riding on the metal belt which is in tension against it.



Producing VINYL COUNTER TOPPING

Setup showing individual calendered plies being fed into the Rotocure for lamination. This setup consists of a clear film for the wearing surface, a printed vinyl subface, and four backing plies of a highly filled vinyl.



The finished laminated counter topping being rolled up as it issues from the Rotocure. The material can be slit into individual rolls on the Rotocure if desired.

Another Quality Product of

BOSTON WOVEN HOSE & RUBBER COMPANY

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In straight lengths, curves, rings, segments and with fins. 4½" to 95" lengths; ⅝" to 2½" width. Iron, steel and alloy sheaths.

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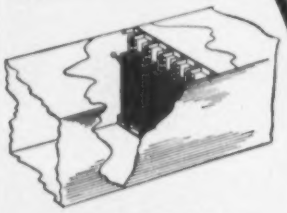
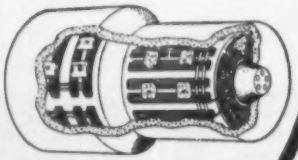
electric
heat for Processes and products

TYPICAL APPLICATIONS



Chromalox Electric Fin-Strip Heaters mounted in air ducts.



Plastic extrusion barrel with Chromalox Ring, Straight and Curved Strip Heaters.

10-50

CHROMALOX Electric Strip Heaters give clean, dependable and accurately controlled heat. They are widely used in platens, dies, kettles, tanks, ovens, air ducts and other applications requiring accurate temperature control and around-the-clock service.

If you are a user of heat, either in processes or products, you can get many valuable application ideas by sending for the booklet below. On-the-job engineering assistance, without obligation.

CHROMALOX

Electric Heat for Modern Industry

WANT MORE FACTS?
Send for this booklet of application ideas you can adapt for use in your plant. Write for your free copy today.

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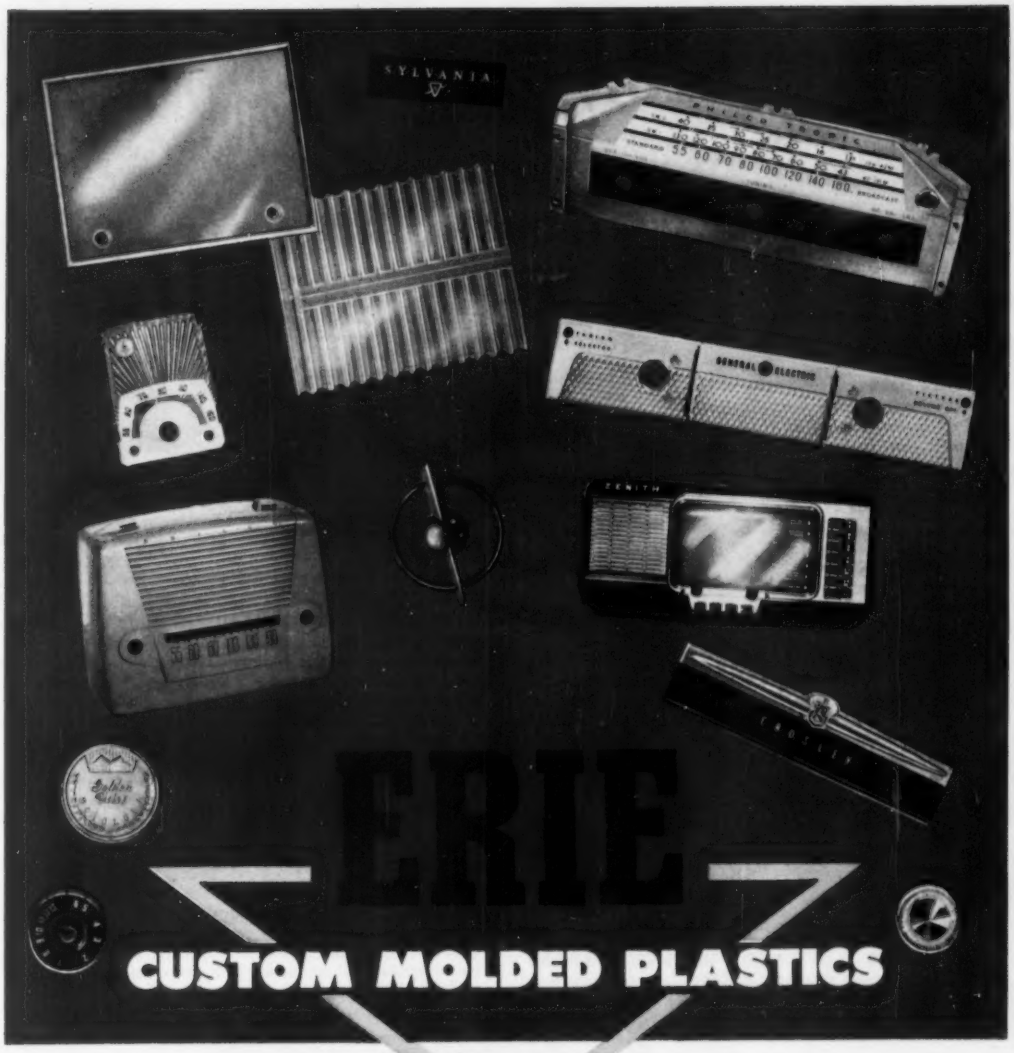

for Radio and TV

RADIO and television manufacturers have long depended on Erie . . . the pioneer in custom injection molded plastics . . . for such basic units as lens and frame in a single piece . . . cabinets, dials, gauges, control knobs, and sparkling three dimensional name plates and trademarks, as well as military items. They have learned that Erie combines the beauty of quality molding with the economy of production know-how.

Write for your copy of bulletin, "Who We Are . . . What We Do in Plastics."

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Main Offices: **ERIE, PA.**

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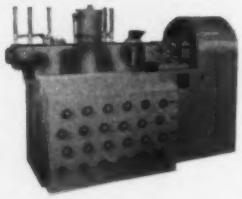
The Superior Production Efficiency

OF WELDING ENGINEERS

COMPOUNDING—EXTRACTING—EXTRUDING EQUIPMENT*



Means Increased Profit Potential For You

THIS is a concise review of some typical applications of Welding Engineers dual worm machinery in the plastics, chemical, and rubber industries.

The unique latitude available in worm combinations and barrel lengths of Welding Engineers equipment makes it ideal for a *wide variety* of compounding and processing operations:

COLORING POLYSTYRENE . . . Pigments or dyes can be mixed with granules or beads of polystyrene, and on issuing from the machine, a uniformly colored blend is produced to meet the highest color standards.

COMPOUNDING CELLULOSE ACETATE MOLDING POWDER . . . A powder blend of the necessary ingredients is fed to the hopper and the action of the dual worms forms a fused and homogeneous product. In its progress along the barrel, moisture is flashed off through the extraction opening and finished molding powder is produced.

COMPOUNDING PHENOLIC MOLDING POWDER . . . A mixture of raw ingredients such as resin, catalyst, lubricant, filler, coloring, etc., is fed in powder form. In one operation, these materials are fused, compounded, moisture is removed under vacuum, cure of the resin advanced as required and finished pellets of the desired flow produced for molding or grinding.

COMPOUNDING ELASTOMERIC VINYL . . . A powder blend of resin, plasticizer, stabilizer, lubricant, color and filler . . . with or without a percentage of scrap, is fed into the hopper. These materials are compounded into a homogenized product and pelletized in one operation for subsequent use. In many applications, elastomeric vinyl can be extruded to a desired shape as a finished or semi-finished product.

COMPOUNDING RIGID VINYL . . . The prescribed powder blend is fed to the machine and pelletized ready for subsequent use. The output rate is established at 100-125 pounds per hour on the smallest machine in the Welding Engineers line. Larger machines are rated in proportion.

EXTRUDING RIGID VINYL . . . Pipe, bars and other shaped extrusions of excellent quality are made with the use of appropriate dies. Welding Engineers designing makes it possible to extrude rigid vinyl without removing the worms at the end of each run. In spite of the heat sensitivity of most of these formulations, it is necessary only to remove the die and rotate the worms for a one or two minute period to prepare the machine for further operation.

DEWATERING SYNTHETIC RUBBER . . . The extractor used in this operation has treated many types of coagulated synthetic rubbers with 35% to 50% water on a total basis in the feed and is capable of producing a product with from .1% to .5% moisture. A rate of 100-160 pounds per hour depending on the feed material is obtained with the smallest Welding Engineers model. Other machines in the line produce at proportionately higher rates.

RUBBER COMPOUNDING . . . Dispersion of carbon black, oil and other ingredients can be continuously performed to give uniform quality extrusions. Breakdown of rubber to remove its nerve can also be accomplished.

SCRAP . . . Polyethylene, vinyl and other scrap materials can be economically processed on this equipment because of its excellent compounding capabilities and its acceptance of materials in forms considered difficult to feed at the hopper.

EXTRACTION OF VOLATILES FROM THERMOPLASTICS . . . Numerous extraction operations for the removal of moisture, catalyst, monomer, etc., from acrylic, polystyrene and other materials, are custom-fitted to particular requirements in standard design Welding Engineers machines. In the extraction zone the material is thoroughly masticated on the two worms in a long chamber while exposed to a vacuum as low as 6 mm. absolute pressure.

SPECIALTY APPLICATIONS . . . Because of the variability of design features in Welding Engineers machines, an unusual number of specialty applications are successfully filled: difficult coloring of polyethylene, processing of "Kel-F", densification of fluffy resins and treatment of new specialized materials.

*Patents Issued and Pending

Your Inquiries Will Receive Prompt Attention

WELDING ENGINEERS, Inc.

Norristown, Pennsylvania

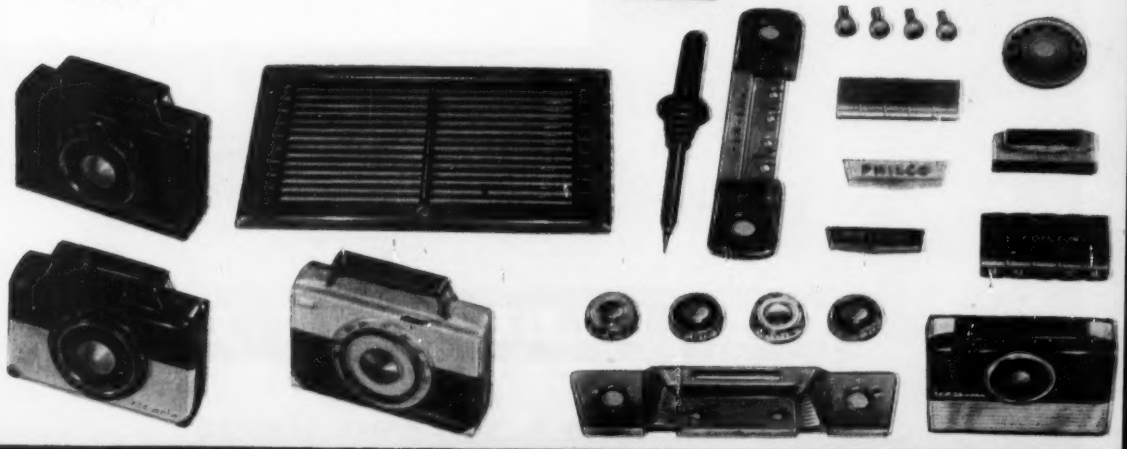
Santay PLASTICS

...MODERN MOLDING FOR MODERN LIVING

No boy can do a man's job. So, too, it takes more than just ordinary men and equipment to keep up with the pace of modern plastics production. It takes *special* men . . . qualified workers who are trained to produce the best . . . the very best. It takes production facilities complete with the latest in speedy, efficient, up-to-date equipment . . . equipment designed to give you *better* products.

Leading manufacturers knew this . . . that is why they choose SANTAY to fill their every need in plastic molding. They know the SANTAY plant is equipped with only the very newest in modern molding machinery . . . not only to mold plastic parts, but equipped to finish and completely assemble them in to the end product as well. They know that only SANTAY can assure them of greater economy because of SANTAY's diversified experience.

SANTAY is proud of its reputation. SANTAY is proud of the products it molds. Call in a SANTAY engineer today. Let him help solve your molding problems.



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KLEESTRON
POLYSTYRENE MOULDING POWDERS
THE VERSATILE PLASTIC
No need to state the virtues of polystyrene. It is accepted all over the world for its versatility . . . its adaptability. At long last the designer has been given a moulding powder reasonably free from limitations.
No need either to state the virtues of Kleestron. Enough to say it is made by Kleemann's in their new factory at Welwyn Garden City and is being sold . . . and moulded . . . and praised all over the world.
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Ideas ... molded in plastics by MALLORY

Idea

Use plastics to make cams and cam spacers for switches on high speed electric motors in aircraft controls.

This job was compression molded in white and colored urea for color coding. Splines and serrations were held to extremely close tolerances.

Idea

Dress up the appearance of a washing machine with a colored mounting plate for the timer switch.

The plates were compression molded in attractive colors of alkali-resistant urea. The degree of curvature of the back was closely held to assure a snug fit on the metal shell of the tub.

Idea

Make an exact scale model of a railway gondola car for serious minded hobbyists.

We injection molded this in black and red ethyl-cellulose with every detail faithfully reproduced. Flatness, bulges and sink marks were carefully controlled.

Turning ideas like these into finished products requires plastics specialists ... backed by complete design, mold making and production facilities. Mallory Plastics is well equipped to assist you in product design ... to select the right material for the job ... and to engineer and build tailor-made molds. If you have an idea that can be produced in plastics, write or call us today.

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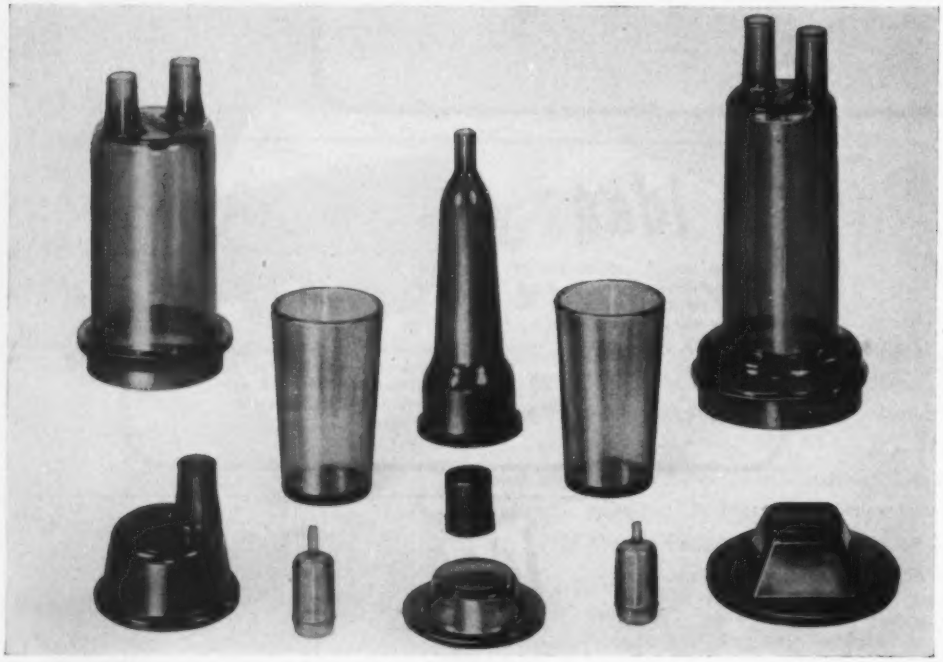
M-66 TRANSPARENT THERMOSETTING MOLDING COMPOUND



Illustrated are a variety of parts molded from M-66 Transparent Amber Phenolic Compound. Its transparency and complete resistance to sterilization temperatures, makes it ideal for many applications in the television, radio, electronics, hospital and dairy industries.

The molding of the M-66 requires no unusual skill or technique to obtain satisfactory results. It may be molded to close tolerances by either the compression or transfer method.

AVAILABLE IN AMBER, GREEN & RED

HERESITE & CHEMICAL COMPANY

MANITOWOC, WISCONSIN

THESE "FIRSTS"

. . . the first extruder specifically designed for thermoplastics

. . . the first electrically heated plastics extruder

. . . the first long-barrelled extruder

. . . the first "torpedo" feed screw

. . . the first truly accurate temperature control—"Balanced Heat Control"

. . . the first really fast operating die gate adapter

. . . and, the first full line of extruders to meet all plastic extrusion requirements

make NRM the First choice

for **EXTRUDERS ACCESSORIES** and **AUXILIARY—EQUIPMENT**

Learn more about NRM's creatively engineered equipment, today. Write for our new catalog. It's packed full of information on better equipment for better extrusions — and, it's yours for the asking.

2080

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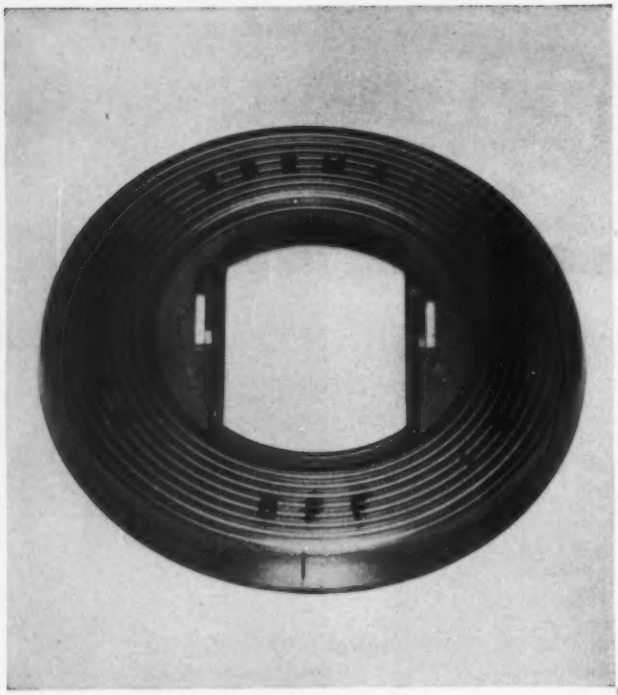

PLASTIC FOR INDUSTRY

Illustrated are two decorative plastic pieces currently being molded for the Midwest Manufacturing Company, Galesburg, Illinois, for the Admiral refrigerator. The parts are produced in polystyrene and decorated.

Our facilities are available for the production of large refrigeration components such as evaporator doors, breaker strips, door baskets, trims etc. We have capacity of up to 60 ounces and complete finishing facilities for all type of decorative work. Your inquiries are welcome and our engineers are at your service for consultation at all times.

CRUVER Manufacturing Company

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Material Manufacturers–Plastic Compounders–Molders

GET THESE 8 COMBINED ADVANTAGES IN REDS AND YELLOWS FOR COLORING YOUR PLASTIC MATERIAL

REDS and YELLOWS

CADMOLITH COLORS

Glidden leadership in pigment research offers material manufacturers, compounders of new or old materials, plastic molders, or coaters a combination of advantages found in no other Red or Yellow pigments. These colorants, in Glidden CADMOLITH* Colors make your coloring job easier—give finest, most lasting colors in powders or plastic products made from them.

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7. Wide Range of Shades
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SEND FOR THIS FOLDER giving complete details, with color chips. Write The Glidden Company, Chemical & Pigment Company Division, Union Commerce Building, Cleveland 14, Ohio.

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QUALITY Glidden PRODUCTS

SUNOLITH* Lithopone
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CHEMICALS • PIGMENTS • METALS DIVISION
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You saw this ad in Tool Engineer, Machinery, Modern Machine Shop, American Machinist Iron Age

and at CRUCIBLE MOLD STEEL *is* TOOL STEEL

Take our experience as tool steel leaders for more than 50 years — add it to the unique staff of mold steel specialists we maintain — and the result is *better* mold steel!

That's why Crucible mold steels are consistently chosen for most exacting molds. And why mold steel users are checking our strategically located warehouses for stocks to meet their needs.

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Get your copy of the unique Crucible Tool Steel Selector — a quick twist of the dial gives you the right tool steel for the right job. And it will help you select mold steel! Selector has 9-inch diameter; printed in 3-colors.

CRUCIBLE first name in special purpose steels

52 years of Fine steelmaking **MOLD STEEL**

CRUCIBLE STEEL COMPANY OF AMERICA • TOOL STEEL SALES • SYRACUSE, N.Y.

"More Power to You—Safely, with SYNTHANE"

Electrical energy is restless . . . would jump at any chance to escape—if it could.

The fact that voltage can be stepped up for transmission, stepped down for use; that current can be led to and from transformers, around switchboards, and steered into circuits safely you may credit to electrical apparatus builders. Important materials to them are Synthane laminated plastics.

Synthane laminated plastics are used in transformers for spacers and coil forms because it is an insulator unaffected by oils; in tap changer panels because it is a machinable insulator with high dielectric strength; in "Glowtectors" because of high insulation resistance and abuse-resistance; in circuit breakers and bus bars for its arc resistance.

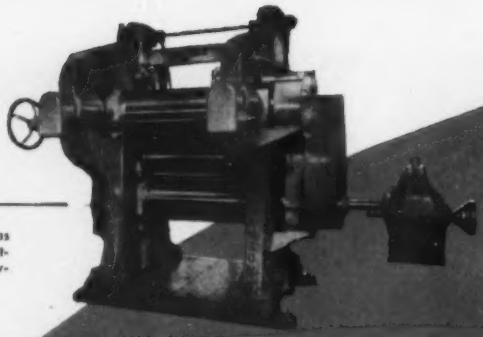
Synthane, an unseen essential to power generation, transmission, and control, may be helpful to you. Send for your copy of the Synthane Catalog and learn all about Synthane's combination of electrical, chemical, physical and mechanical properties. Synthane Corporation, 8 River Road, Oaks, Pennsylvania.

PETTICOAT STANDOFF INSULATORS machined from Synthane square-hole tubing. Here, Synthane was specified for its good dielectric properties, machinability and rugged strength.

Synthane-one of industry's unseen essentials

SYNTHANE

LAMINATED PLASTICS



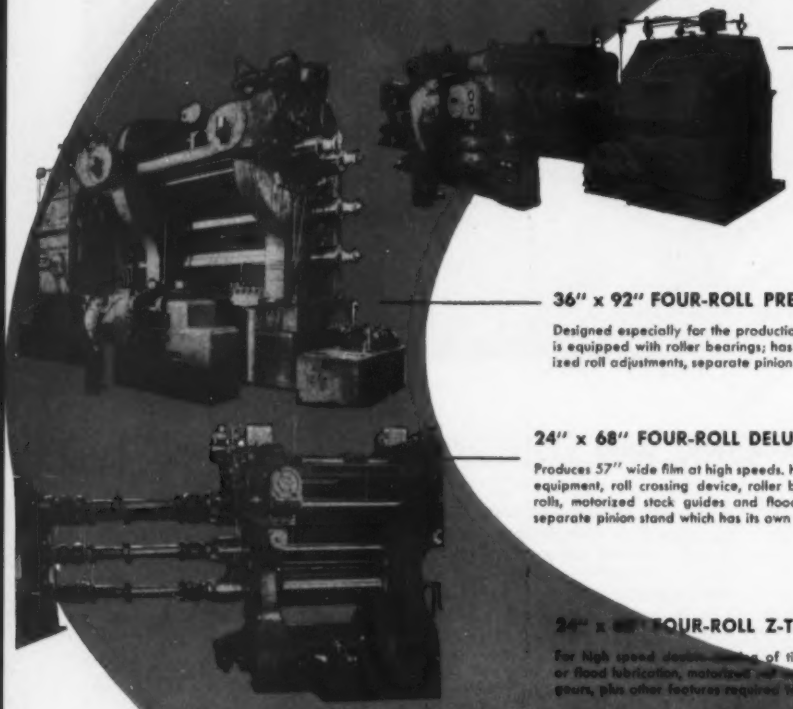
16" x 36" FOUR-ROLL CALENDER

For rubber and sponge products. Has sleeve bearings, herringbone connecting gears, manually operated screw-downs, and grease lubrication.

20" x 54" THREE-ROLL CALENDER

For medium speed production of various types of rubber products. Equipped with herringbone even speed and friction gearing, sleeve bearings, grease lubrication, and motorized roll adjustments. Drive can be adapted to suit available space.

ADAMSON UNITED CALENDERS -



30" x 54" TWO-ROLL HORIZONTAL CALENDER

For finishing asphalt floor tile. This machine is equipped with roller bearings, drilled rolls, pinion stand drive with universal couplings, motorized roll adjustments, and adjustable speed control for tandem operation.

36" x 92" FOUR-ROLL PRECISION CALENDER

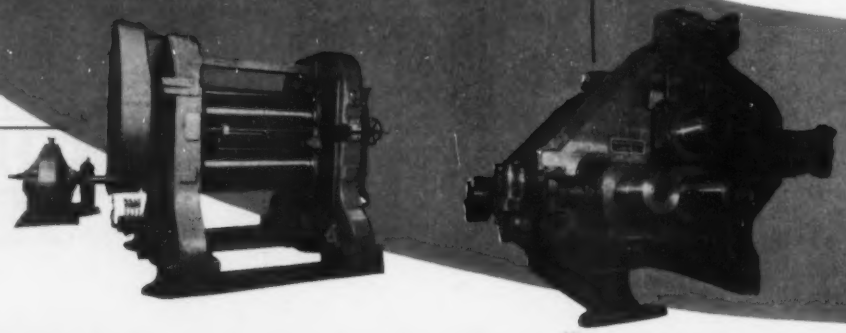
Designed especially for the production of thin plastics film up to 72" wide. This unit also is equipped with roller bearings; has roll crossing and zero clearance equipment, motorized roll adjustments, separate pinion stand with universal couplings and flood lubrication.

24" x 68" FOUR-ROLL DELUXE PLASTICS CALENDER

Produces 57" wide film at high speeds. Has roller bearings, zero clearance equipment, roll crossing device, roller bearing universal couplings, drilled rolls, motorized stock guides and flood lubrication. Drive is through a separate pinion stand which has its own complete flood lubrication system.

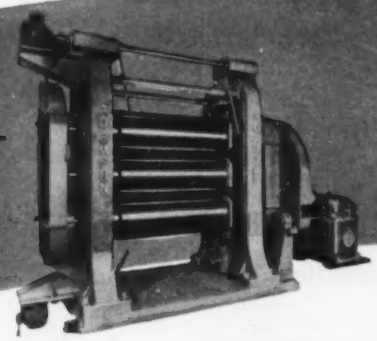
24" x [illegible] FOUR-ROLL Z-TYPE RUBBER CALENDER

For high speed [illegible] of tire fabric. Has sleeve bearings with grease or flood lubrication, motorized [illegible] adjustments, herringbone connecting and drive gears, plus other features required for [illegible] production.



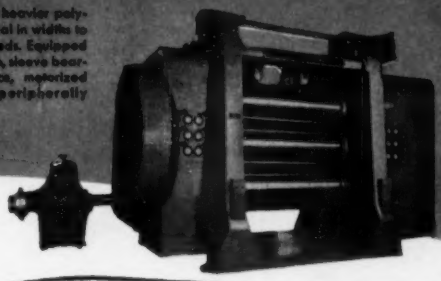
24" x 52" TWO-ROLL CALENDER

Another Adamson calender, vertical type, used in the production of floor tiling.



24" x 68" FOUR-ROLL STANDARD PLASTICS CALENDER

Produces 2 mil and heavier polyvinyl chloride material in widths to 57" at medium speeds. Equipped with flood lubrication, sleeve bearings, zero clearance, motorized roll adjustments, peripherally drilled rolls.



- - for RUBBER and PLASTICS

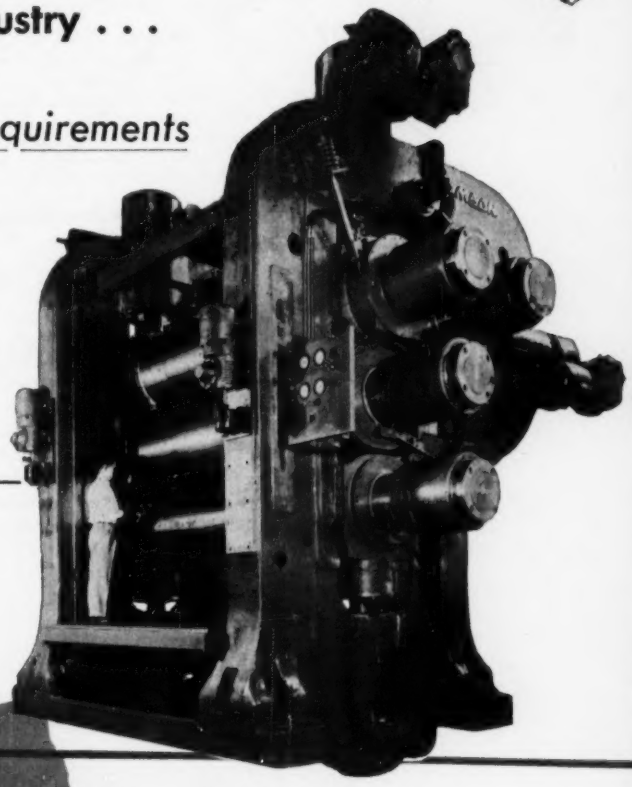
designed for the industry . . .

Engineered to your special requirements

Shown are some of the many types of calenders made to order for our customers.

Given product specifications and required maximum speed, we will design, build and install all basic and auxiliary equipment required for your complete manufacturing process.

We invite your inquiry concerning calendering or any other rubber or plastics processing problem.



32" x 92" FOUR-ROLL PRECISION CALENDER

This unit is geared to produce 72" wide vinyl film, 2 mils and less in thickness, at production speeds up to 150 YPM. It is equipped with anti-friction bearings, zero clearance, motor operated stock guides, motor operated roll crossing device, flood lubrication, universal couplings, pinion gear stand, drilled rolls and automatic temperature control. The electrical drive includes separate DC motors for each component, with speed trimming devices. Auxiliaries consist of embossing equipment, cooling unit and automatic turret-type windup.

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BETTER MACHINES AND PROCESSES FOR BETTER RUBBER AND PLASTICS PRODUCTS

Temperamental geniuses may need warning signs to keep customers from ruffling their sensitive souls, but any Boonton customer will tell you that a short temper definitely is not one of the ways in which *our* genius manifests itself. One of our strong points is *smoothness*—smoothness in the way we handle customers, smoothness in the way we handle their plastics problems.

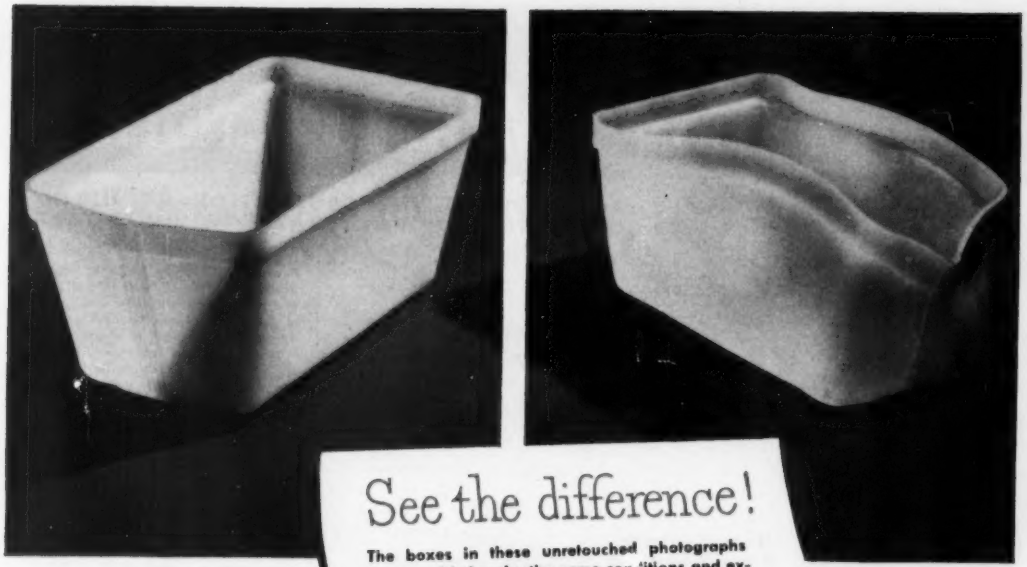
Speaking frankly, some of the gentry we've dealt with in the past thirty years have been real Lulus—demanding the impossible and shouting Bloody Murder when they couldn't get it; but $99\frac{44}{100}\%$ of them, thankfully, have been the milder kind. The same goes for their problems—some have been tough; others easier. We've had our share of both.

Assuming that you're a reasonably rational human, with a piece to be molded by compression or injection, we'll be happy to show you what we think is the best and least expensive way to do it. Even if *you* have a few minor idiosyncracies, please remember we have a world of patience. Boonton believes in courtesy, not curtness. Be glad to see you!

BOONTON MOLDING CO.

BOONTON, NEW JERSEY

NEW YORK OFFICE — CHANIN BUILDING, 122 EAST 42ND STREET, MURRAY HILL 6-8540



See the difference!

The boxes in these unretouched photographs were molded under the same conditions and exposed to a temperature of 212°F. The box on the left, made from Koppers MC 409, showed little or no distortion after 30 minutes at this temperature. The box on the right, made from a widely used commercial modified polystyrene, showed major distortion within 10 minutes.

high heat resistance in a modified polystyrene...

KOPPERS MC 409

• Here's the high-heat modified polystyrene that the industry has long wanted . . . Koppers MC 409.

This new material combines three important advantages . . . higher heat resistance *(up to 198°F.*)* . . . the toughness and shock resistance of modified polystyrene . . . and the desirable finish and molding characteristics of regular polystyrene. MC 409's excellent heat resistance is comparable to that of Koppers well known Polystyrene 8.

These qualities make MC 409 an ideal material for radio cabinets, battery cases, washing machine and refrigerator parts, toys, housewares, brush handles and, in fact, any molded or extruded polystyrene product subjected to heat.

Koppers MC 409 makes possible sturdy, shock resistant, plastic products that withstand the high temperatures found in show windows, dishwashers and automobiles, where other modified polystyrenes sag and shrink. Tests prove that on exposure to boiling water MC 409 will show low deformation with a minimum of shrinkage.

FOR FREE SAMPLES for testing in your laboratory and for Technical Bulletin C-2-161-TR describing the properties and characteristics of MC 409, write, wire or phone Koppers Company, Inc., Chemical Division, Dept. MP-112, Pittsburgh 19, Pa.

**A.S.T.M. D-648-45T.*

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Koppers Plastics Make Many Products Better and Many Better Products Possible

Koppers Plastics

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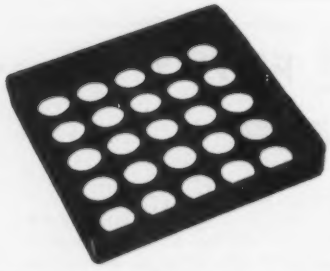
ROGERS CORPORATION

IMPACT PHENOLICS

FOR VOLUME PRODUCTION OF HIGH STRENGTH PARTS AT LOW UNIT COST

Shock Resistant handles for machetes are molded of RM sheet compounds, using blanked preforms.

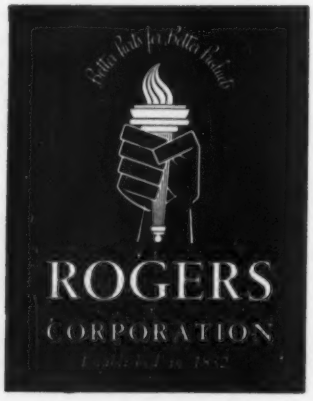
Miner's Cap Lamp is made of Rogers medium high impact RX 428 phenolic. Approved by Bureau of Mines.



Tote Tray, molded of Rogers RX 429, withstands shock, hot water immersion, steam blasts.

Matrices of Rogers phenolic sheet mold quickly at low temperatures with fidelity of reproduction.

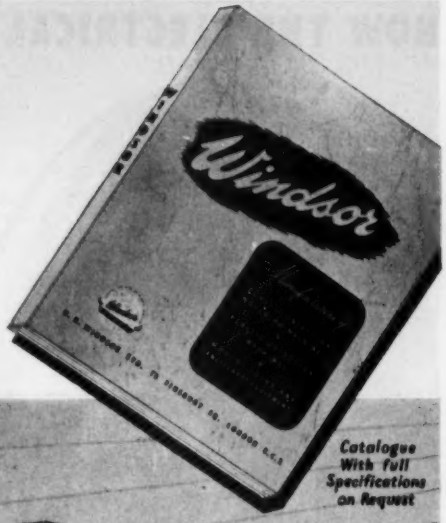
HIGH IMPACT SHEET MOLDING COMPOUNDS RM SERIES	Produced only by Rogers. Impact strengths of 8 to 10 times that of general purpose phenolics. Low bulk factor of 1.5:1. Fast curing. Excellent molded appearance. Supplied as sheets, strips or preform blanks ready for molding. PRE-SHAPED PREFORMS can be supplied for exceptionally high strength parts. Low bulk factor of 1.5:1. Supplied shaped to fit the mold and of correct size and weight ready for molding.
MEDIUM TO MEDIUM HIGH IMPACT BULK MOLDING COMPOUNDS RX SERIES	From 2½ to 5 times the impact strengths of general purpose phenolics. Low bulk factor of 3.5:1. All grades readily preformed on automatic tabletting machines. Good molded appearance. Generally can be molded in same molds used for general purpose materials. Clean, dustless, fast-curing. Can be compression, transfer or plunger molded.
LAMINATES (LAMOROK)	Special purpose laminated phenolics in grades to meet NEMA specifications X, P, XXP, XXX, and XXXP. Phenolic impregnated core materials for laminating. Formulated to meet standard or special requirements. Supplied as a one piece core in the correct thickness up to ⅛", ready to laminate.
MATRIX MATERIALS	Phenolic sheet material for making matrices from which rubber or vinyl printing plates can be molded. Also widely employed in making embossing plates and embossing bed boards.



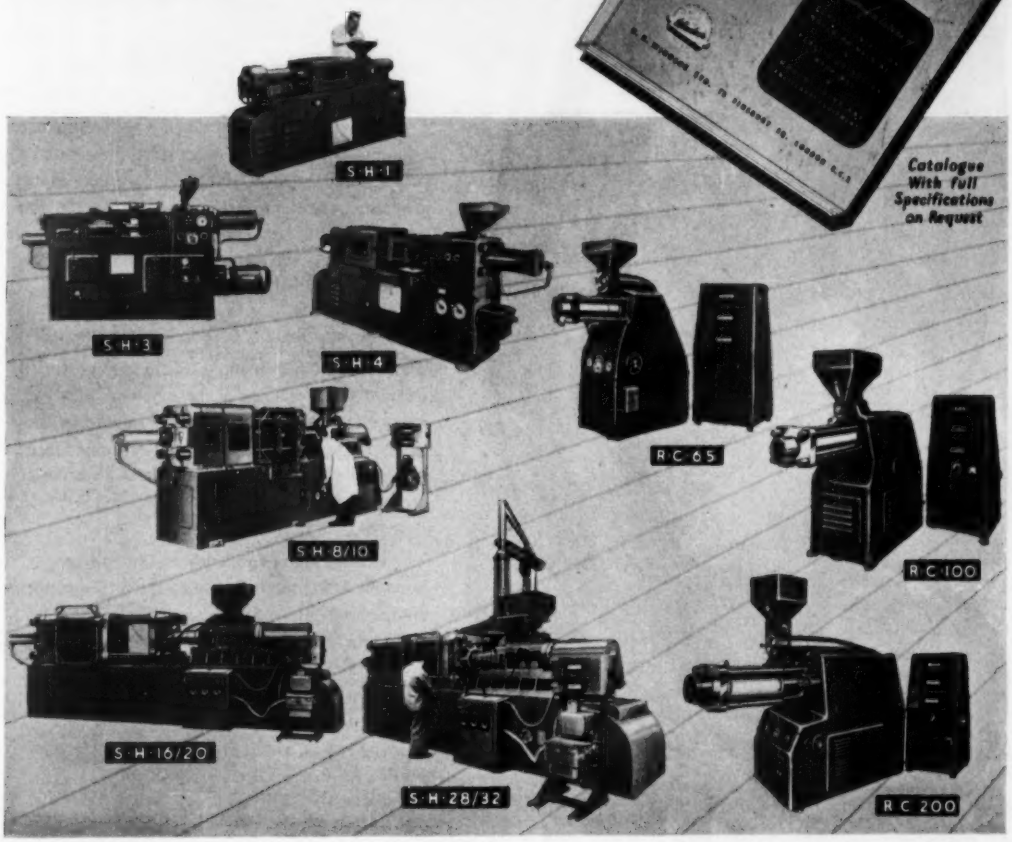
Rogers phenolic Fiberloys for molding are designed for high speed production operations. In addition, their basic formulations can be readily modified. Made-to-order compounds can be quickly developed to meet special needs. For details on our phenolic Fiberloys, please write Dept. PE, Rogers Corporation, Manchester, Conn.

The **Windsor**

Range of Precision
INJECTION MOULDING & EXTRUSION MACHINES



Catalogue With Full Specifications on Request



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HOW THE ELECTRICAL INDUSTRY BENEFITS FROM

SHOCK-RESISTANT
G-E rubber-phenolics

Here's an example of the unique benefits G-E rubber-phenolic compounds offer users.

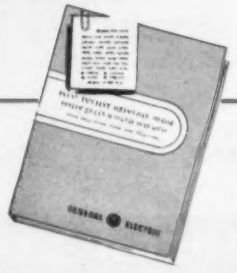
An electrical manufacturer formerly used collector assemblies consisting of brass rings press-fitted over a laminated tube. To reduce costs and improve insulation, an attempt was made to mold the item as one unit. But conventional phenolics failed—cracked excessively due to the differential in shrinkage between brass and plastics.

Lower Costs—An Improved Product

Then G-E rubber-phenolics were recommended. Result? The resilience of these new plastics overcame the cracking . . . also permitted swaging of the rings after molding which further reduced any tendency to crack. Net result: a lower-cost assembly with superior insulation—made possible *only* by G-E rubber-phenolics.

The extraordinary resiliency of G-E rubber-phenolic compounds is due to the nitrile rubber component. With *over five times* the shock resistance of conventional phenolics, they have worked successfully in scores of applications where ordinary impact materials fail.

Collector ring assemblies, lower in cost and with superior insulation, are now being molded of shock-resistant G-E rubber-phenolics for Warner Electric Brake & Clutch Company by Rockford Molded Products Company.



Send for free booklet, For more information about this rugged family of plastics, write today for a free copy of "New Rubber-Phenolic Materials for Greater Impact Strength." Address: General Electric Company, Section 123-7A, Chemical Division, Pittsfield, Mass.

You can put your confidence in—

GENERAL ELECTRIC

WINDSOR'S

complete Extrusion take-off equipment for the production of rigid unplasticized P. V. C. tubes from 1 in. to 6 in. diameter

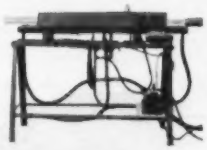


Illustration showing the water tank, where the final cooling of the extruded tube is accomplished. Water supply and drain valves are positioned at convenient locations.

Illustration showing the positive pulling device. The speed is controlled to very fine limits by an electronic variable speed unit. The speed regulator is mounted remotely from the motor and is situated near the die conveniently for the operator.

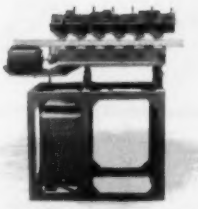


Illustration showing the cutting-off device, comprising a belt driven circular saw mounted on a ball bearing tracked table. Unison between tube and cutting blade is maintained by clamping the extruded tube, which is positively delivered to the moving table by the positive pulling device. Cutting takes place whilst the table is at liberty to move along its tracks. Saw automatically cuts out when not in use.

Illustration showing a yoke type adjustable centering die, with a detachable water cooled former tube. Air is introduced through the mandrel of the die to facilitate blowing tube to size in the water cooled forming tube.

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From protective coverings in the Arctic to beach mattresses in the Tropics, today's vinyl plastic products must meet new and rugged temperature conditions. The broad line of Pittsburgh PX Plasticizers will provide you with the specific plasticizer, or the combination of plasticizers, you need to insure optimum *stability* and *flexibility* in vinyl products under practically any temperature extreme.

And remember this: as a basic producer, we're also able to offer you the assurance of top uniform plasticizer quality from one order to the next . . . fast, efficient shipments . . . and dependable, continuing supplies. What's more, our engineers may be able to show you how to further increase the quality of your product and reduce production costs through better plasticizer selection and use. *Why not call or write us today?*

PX-104	DiButyl Phthalate
PX-108	DilsoOctyl Phthalate
PX-138	DiOctyl Phthalate
PX-208	DilsoOctyl Adipate
PX-238	DiOctyl Adipate
PX-404	DiButyl Sebacate
PX-408	DilsoOctyl Sebacate
PX-438	DiOctyl Sebacate
PX-658	TetraHydroFurfuryl Oleate
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Baby Book Bank, molded of acetate for Banthrico, Chicago

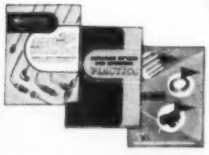
Something to Bank on

This bank can teach you a profitable lesson in plastics. While it was made to teach a child one of the dependable virtues, it also tells you about one of the most dependable virtues of the Elmer E. Mills Corporation . . . our imagineering* versatility. It is proof of the painstaking care and attention we give to injection molding and extrusion jobs from the simple to the highly complex.

You can always bank on this fact: A product molded by the Elmer E. Mills Corporation will be a brilliant example of the plastic molder's craftsmanship and scientific ingenuity.

Bring your next molding job to us. You will be more than pleased with the result.

*Imagination and Engineering Skill



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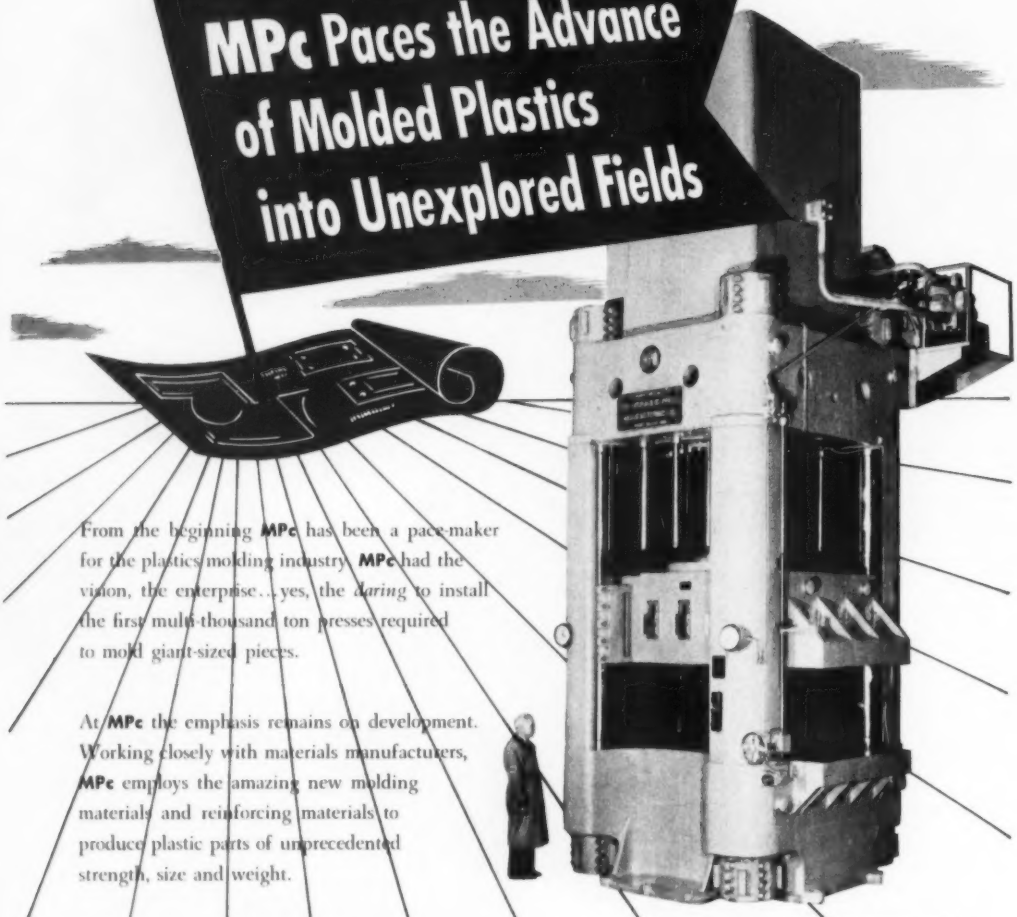
MPc Paces the Advance of Molded Plastics into Unexplored Fields



From the beginning **MPc** has been a pace-maker for the plastics molding industry. **MPc** had the vision, the enterprise... yes, the *daring* to install the first multi-thousand ton presses required to mold giant-sized pieces.

At **MPc** the emphasis remains on development. Working closely with materials manufacturers, **MPc** employs the amazing new molding materials and reinforcing materials to produce plastic parts of unprecedented strength, size and weight.

The challenge of the new or unusual is met at **MPc** with inventive engineering skill...supported by unmatched molding and tool-room facilities. Product design engineers with big ideas are invited to consult with Molded Products Corporation, 4535 W. Harrison St., Chicago 24, Illinois.

Molding presses with capacity from 50 to 3000 tons

The MPc tool-room has produced the largest molds made in this country...

...and some of the smallest and most intricate molds

PLASTICS DIVISION
MOLDED MPc PRODUCTS
CORPORATION
...Pace-Makers in Plastics Molding

FREE "Data Book of MPc Facilities," an engineering-eye view of MPc press capacities and other production facilities...together with a survey of MPc special skills available for your use. Write for your copy.

Now Available! A Solution to Your Dicing Problems!

The CUMBERLAND DICING MACHINE *features* **THE SIMPLEST, LEAST EXPENSIVE METHOD OF DICING YET DEVISED!**

This new Cumberland dicing (or cubing) machine efficiently dices plastic sheet stock into a wide variety of cube sizes. Input speed ranges from 10 feet to 125 feet per minute.

A proven machine, the Cumberland dicer is a modified form of the well-known rotary chopping machine regularly used for many applications throughout the plastics industry. The new dicer has satisfactorily diced *millions* of pounds of plastics!

If you are interested in dicing plastic materials easily and inexpensively, you'll want to investigate the Cumberland dicing machine right away!

WRITE FOR COMPLETE TECHNICAL DETAILS!

USE THIS MACHINE FOR THESE OTHER APPLICATIONS, TOO!

1. Cut heavy vinylite slabs.
2. Cut continuously extruded scrap!
3. Cut side shear from calendering machines.
4. Produce pellets from continuous strands.

For details, request Bulletin 401.

CUMBERLAND MANUFACTURES A COMPLETE LINE OF PLASTICS REDUCING MACHINES

PREBREAKER

Cuts up radio, television cabinets and other large parts. Available with 20" by 32" throat opening (Model 32) and 10" x 24" throat opening (Model 24). Write for details.

GRANULATING MACHINES (All Models)

Seven different models, direct coupled and V-belt driven, are available to meet your requirements. For complete details, request Bulletin 251.

MODEL 18 GRANULATOR

Large capacity double-hung construction for heavy duty applications. Like all Cumberland machines, it is easy to adjust, dismantle, and clean.

CUMBERLAND Engineering Company Inc.

BUILDERS OF BETTER MACHINES FOR THE PLASTICS INDUSTRY

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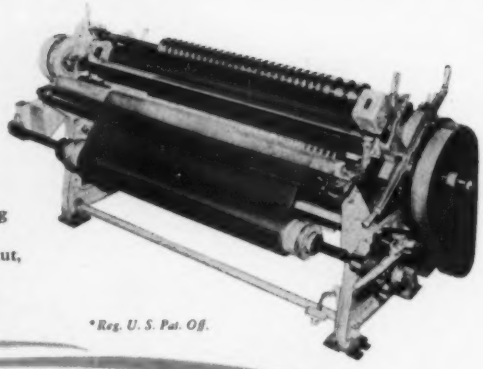
4113 West Jefferson Blvd., Los Angeles 16, Cal.

The famous Camachine line of roll production equipment includes three standard slitter-rewinders for fast, low cost production of top-quality rolls of various types of plastic film and plastic coated materials. All three machines employ the differential rewind principle to assure rolls of uniform density regardless of caliper variation.

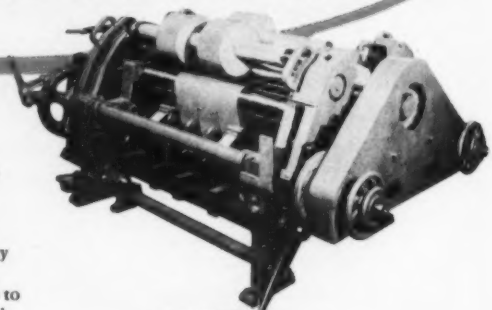


TYPE 26 A popular, versatile slitter-rewinder for the lighter gauge films rated at speeds up to 500 fpm depending upon the characteristics of the material, number of cuts, etc. May use Camachine Pneucut* pneumatic score-cut, or razor type slitter elements, or Camachine electrically heated Sealcut* slitter-fuser. Available in widths from 26" to 62". Maximum rewind diameter 17¾".

*Reg. U. S. Pat. Off.

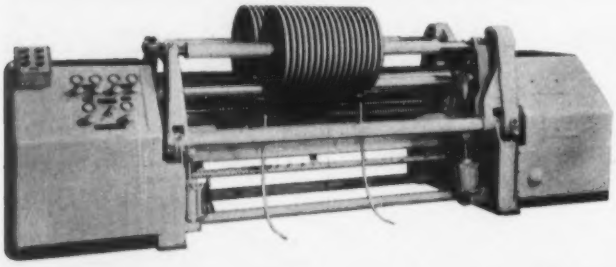
FILM SLITTERS

the right speed, the right capacity to suit various plastic films and coated materials!



TYPE 28 A heavier machine with larger rewind capacity (30" diameter). Employs either Camachine Pneucut pneumatic score-cut elements or shear-cut elements for slitting. Rated at speeds up to 800 fpm depending upon the characteristics of the material, number of cuts, etc. Built in widths from 42" to 72".

CHIEFTAIN (Type 29) A semi-automatic, heavy-duty slitter-rewinder for plastic film up to the heaviest gauge. Features a fingertip control panel. Rated at speeds up to 1500 fpm depending upon the characteristics of the material, number of cuts, etc. Built in widths from 42" to 92" with a maximum rewind capacity of 36" diameter. Employs Camachine Pneucut pneumatic slitters.



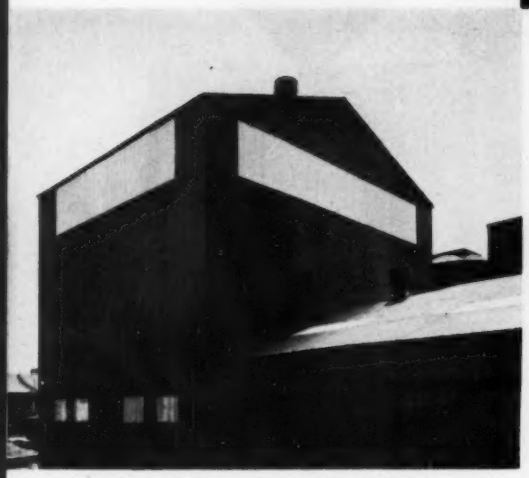
Write for literature on Camachine slitters for handling plastic film. Camachine engineers welcome the opportunity to consult with you regarding fast, low cost production of top-quality rolls.

Look for better rolls at lower cost and you'll wind up with Camachines®

AA-265 CAMERON MACHINE COMPANY • 61 POPLAR STREET • BROOKLYN 2, N. Y.

— for Quality with Economy . . .

EXTRUDED PLEXIGLAS

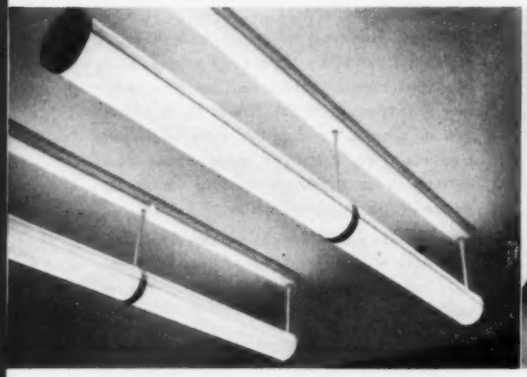


Industrial sidewall glazing, with extruded white translucent PLEXIGLAS, corrugated to match standard industrial siding.

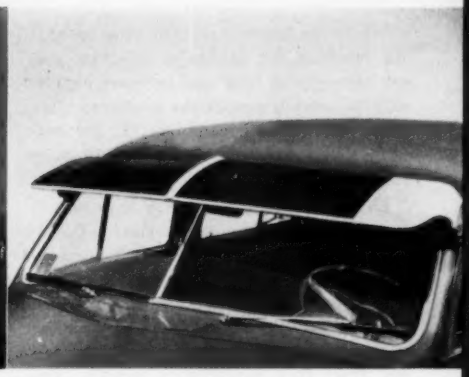
Continuous extrusion—using PLEXIGLAS extrusion-grade molding powder—can be a fast economical method of producing, at low cost, parts having uniform cross sections.

That's why designers are specifying extruded PLEXIGLAS for automobile sun visors, signs, lighting fixtures, counter dividers in retail stores, display fixtures . . . and for glazing prefabricated buildings and industrial structures where window breakage is a problem. These are only a few of the many existing and potential applications.

Extrusion Grade PLEXIGLAS molding powder does more than insure efficient production. Extruded sections have excellent gloss and clarity or color, and the resistance to heat, weather, and breakage for which PLEXIGLAS acrylic plastic is noted.



Totally enclosed lighting fixtures with extruded clear and white translucent PLEXIGLAS semicylinders.



Automobile sun visor with extruded green PLEXIGLAS sections, ribbed on upper surfaces.

(PLEXIGLAS *extrusions illustrated are produced by Sandee Manufacturing Company, Chicago, Illinois.*)

Send for **NEW** *Booklet*

Just published, this booklet shows the wide range of uses of PLEXIGLAS *molding and extrusion powders. Send today for your copy of* PLEXIGLAS *MOLDING POWDERS.*

PLEXIGLAS *is a trademark, Reg. U. S. Pat. Off. and in other principal countries of the Western Hemisphere.*

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Continuous production at a high rate is greatly facilitated by the exclusive Davis-Standard "Stream-Flo" insulating head. Exclusive with our thermoplastic models is our "Therma-Fin"* heating jacket, with tubular heating elements and stainless steel cooling coils, cast into aluminum cooling fins. This construction permits any desired temperature condition to be obtained.

Other features include sectional-type cast steel cylinders, affording precise temperature control. Each section has wear and corrosion-resistant liners. Stock screws are of special steel alloy, with variations available for different compounds. Feed section is a separate casting, with improved-type undercut throat.

Davis-Standard extruders are furnished complete with control panel and all necessary accessory equipment, ready for installation and operation.

Tell us your problems and requirements in extrusion equipment. Our engineers will cooperate with yours to solve your production problems.

*Patent Pending

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Chemigum, Pliobond, Pliolite, Pliovic–T.M.'s The Goodyear Tire & Rubber Company, Akron, Ohio

PROTECTION-PLUS for this OCEAN-GOING BOAT HULL

UNDERCOATED with PLIOBOND before anti-fouling paint is applied, the hull of this ocean-going boat is protected against deterioration. The PLIOBOND coat seals the plywood hull, protects the plywood, holds the bottom paint with a strong, lasting bond. And as the paint wears away, the PLIOBOND provides lasting protection to the hull – preventing rapid deterioration.

This application of PLIOBOND is an example of the great endurance you get when all your bonding is done with PLIOBOND – Goodyear's use-proved thermoplastic adhesive. It gives effective resistance to salt water, weathering, chemicals, stress, strain and shear–can literally be used to "bond anything to anything."

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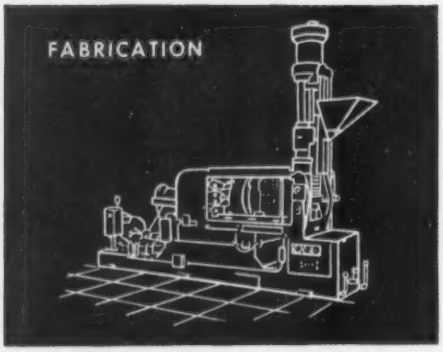
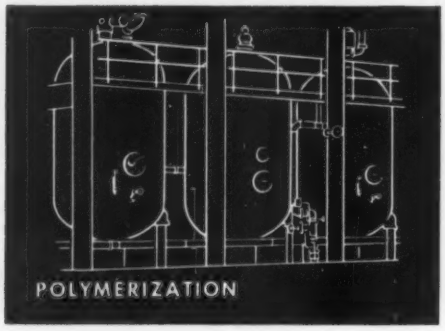


Wherever plastics are made or fabricated, Brown instruments can aid production



IN THE polymerization of literally every type of plastic material . . . synthetic fibres, vinyl, condensation and other polymers . . . Brown instruments contribute invaluable assistance. By measuring and controlling critical temperatures, pressures, flows, pH values, and other variables, they keep complex processes operating smoothly . . . maintain top productivity . . . assure high quality output.

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No matter what your operation may be, you'll find it pays to choose Brown instruments. A broad choice of sensing elements, instrument models, types of control, remote transmitting systems and control valves is available to measure and control every critical process variable . . . with the sensitivity and job-proved dependability that you need.

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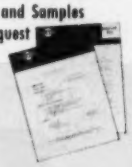
•	**Cabflex Di-OA**	*dioctyl adipate*	low cost standard low temperature plasticizer
•	***Cabflex DDA**	*didecyl adipate*	new low cost, low temperature diester with low volatility and high efficiency

**First all-decyl plasticizers to be introduced to industry in commercial quantities.*
See August, 1952 "Modern Plastics" announcement, page 11.

Technical Bulletins and Samples Available Upon Request



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Plasticizer Division
GODFREY L. CABOT, INC.
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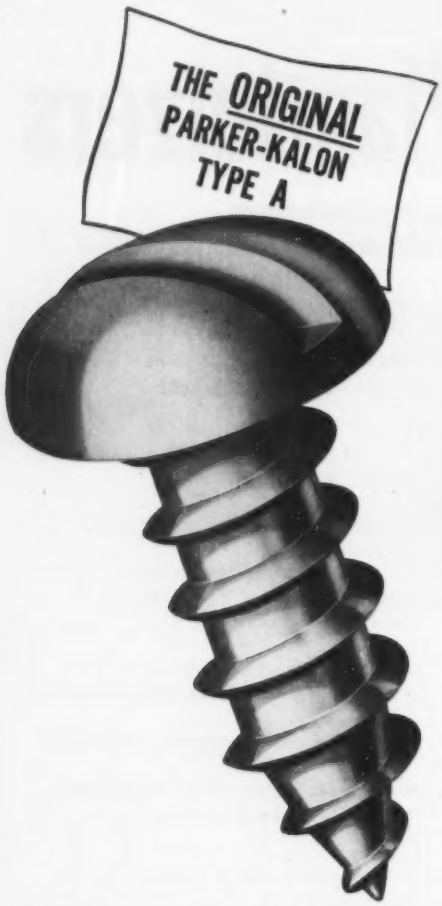
THE FIRST SELF-TAPPING SCREWS STILL WITH ASSEMBLY EXPERTS



"Screws are something like people. If they lose their heads under pressure—if they turn out to be 'softies'—if they don't 'square up', they can slow up a job for sure. We avoid that by specifying Parker-Kalon."

"P-K has developed many types of Self-tapping Screws, and their long experience covers millions of applications. For that reason we know their recommendations will fit the right type screw to the job, and not fit the job to some particular type of screw."

"There's a 'best buy' in everything, and in Self-tapping Screws we've found it's Parker-Kalon. Hardness and toughness are balanced just right, size is accurate, and threads are sharp and clean from head to tip. And that saves time on the assembly line . . . plenty!"

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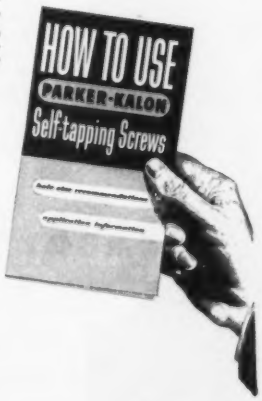
Tells "where to use what" type of screw in all types of metals and plastics, gives hole-size recommendations and other information. Ask your P-K Distributor for Form 480. Or, write Parker-Kalon Corporation, 200 Varick Street, New York 14.



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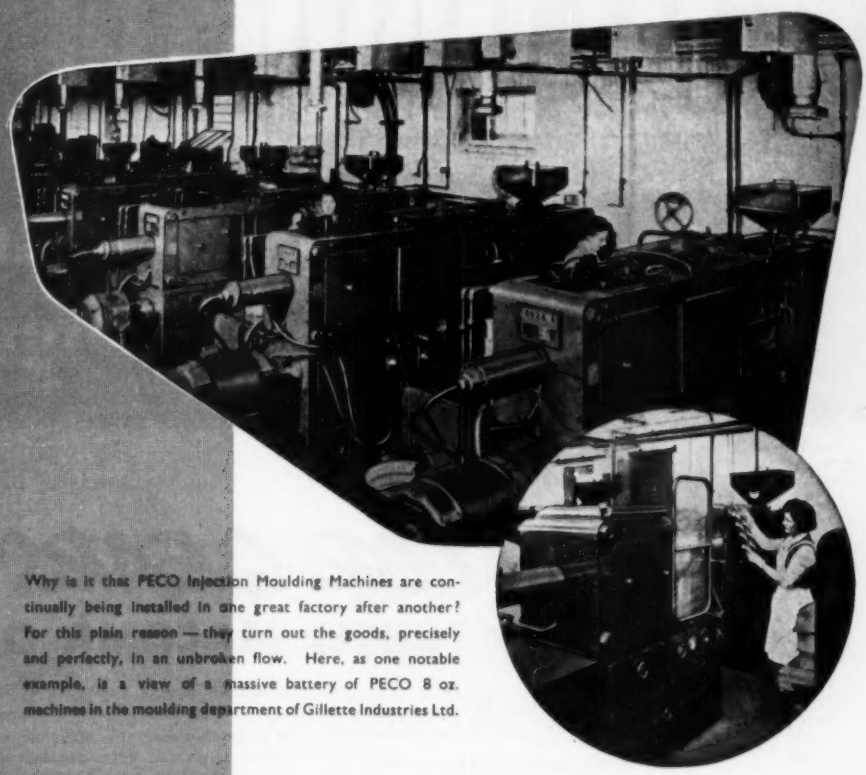
The Original **SELF-TAPPING SCREWS**

AND OTHER FASTENING DEVICES

And Why is It Happening?



Why is it that PECO Injection Moulding Machines are continually being installed in one great factory after another? For this plain reason — they turn out the goods, precisely and perfectly, in an unbroken flow. Here, as one notable example, is a view of a massive battery of PECO 8 oz. machines in the moulding department of Gillette Industries Ltd.

MOULDS

PECO MOULDS. Expert designers and mould makers are employed and moulds can be supplied to samples submitted, including die-sinking models if required. An important side of the Company's work is the hobbing of cavities for moulds and medallions — the plant includes a 3,000 ton hobbing plant. Master hobs to customers' samples made as required.

PECO PRODUCTS

PECO Injection Moulding Machines are supplied in 2, 4, 8 and 16 oz. capacities. They are self-contained with automatic cycle and are hydraulically operated. They have a high plasticising capacity and rate of injection. Mould-locking pressure and platen area enable them to operate at a high rate of production.

Full particulars of the PECO range of injection moulding machines and moulds will be sent on request.

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SHELL

Be sure to get all the facts about these Shell Macoma Oils. Check the coupon and attach to your letterhead for full information.

Two great products of

EP LUBRICANTS

safety to gears and bearings
loads and adverse conditions

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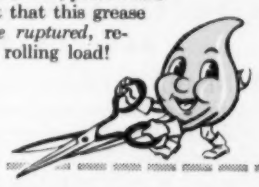
FOR GREASE-LUBRICATED bearings, Shell Alvania Grease . . . the one grease that serves *all* grease applications in the majority of plants . . . *now is available with EP qualities added! . . . now even more Multi-Purpose.*

All of these unique advantages of Alvania Grease are therefore available for the first time to operators of machines subject to extreme bearing pressures:

1. **Higher mechanical stability** than any conventional grease at operating temperatures.
2. **Pumpable at low temperatures** . . . even through centralized lubrication systems.
3. **Stable at high temperatures** . . . no phase changes—still a grease at high temperatures—still a grease upon cooling.
4. **Resistant to water** . . . won't wash out.
5. **Longer service life** . . . reduced consumption.

Shell Alvania EP Grease is the answer to some of the toughest lubricating problems in industry. In rolling operations, for example, operators of steel, rubber, plastic and paper mills report that this grease film *just won't be ruptured*, regardless of shock rolling load!



Check the coupon and mail today for additional information about Shell Alvania EP Grease.

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When the "last word" couldn't say enough...

BRIDGEPORT MOULDED HELPED MAKE THE MOST STRIKING ALL-PLASTIC COSMETIC PACKAGES EVER SEEN

STANDARD PACKAGING could not meet the unique merchandising standards of the new scientific beauty care preparations of The Erno Laszlo Company. 15 skin-care products are packaged to sell at relatively high prices only through personalized beauty consultation in a few leading department stores.

The packaging problem was briefly: (1) The new packages had to say "scientific" and carry out the black and white Marble decor of the Laszlo Institute. (2) They had to be lightweight, yet non-breakable. (3) They had to convey utmost high quality. (4) They had to be modern, yet dignified. (5) They had to appeal to women. The solution? See above. Bridgeport Moulded produced the classic-shaped marbleized polystyrene shell by use of split mold permitting high relief of logotype, lettering, and recessed label. The striking effect of this all-plastic packaging is another example of the advanced methods and thinking Bridgeport can bring to *your* problems. Write today for full details.

Bridgeport Moulded Products, Inc.

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available now
drums or carloads

There are many reasons why you should learn more about Monsanto's HB-40 and its applications as an extender-type plasticizer in processing vinyls. Some of these reasons are bull's-eyed above.

HB-40 has numerous uses—any of which may help you, either in terms of worthwhile savings or maintenance of product quality, or both. For instance—

VINYL EXTRUSIONS—Profile, tubing, belting and wire coating, both electrical and nonelectrical . . . VINYL PASTES—Organosols and plastisols, for fabric coating, free film, floor coverings and dip coatings . . . VINYL SLUSH MOLDINGS—Plastisols for slush molding operations . . . VINYL CALENDERING—Thin film and sheeting, both supported and unsupported.

Write for test samples and try HB-40—please state proposed use. Ask also for Technical Bulletin P-104 . . . Contact any Monsanto District Sales Office, or write MONSANTO CHEMICAL COMPANY, Phosphate Division, 1700 South Second Street, St. Louis 4, Missouri.

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* * *

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SERVING INDUSTRY . . . WHICH SERVES MANKIND

Tupper Seal, air and liquid tight flexible covers fit, and are included in the sets of all Tupperware Canisters.

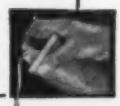
The Tupperware 50 oz. Canister is "standard equipped" with the Tupper Seal, air and liquid-tight flexible Pour All cover.

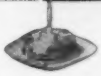
The Tupper Seal, air and liquid-tight flexible Pour All cover is used on every Tupperware 20 oz. Canister.

The Tupper Seal, air and liquid-tight, Pour All cover as a cover for 46 oz. cans; Tupperware Sauce Dishes and other containers of metal, glass or pottery. Foods easily dispensed without removing entire cover.

The Tupperware Wonder Bowls are usually fitted with Tupper Seal, air and liquid-tight covers.

Argentine Patent 74,095 dated Dec. 14th, 1949 on invention covered by U. S. Patent 2,487,400 November 8, 1949. Canada Patent 463,387 Feb. 28th, 1950. Union of So. Africa Pat. 8,592 Sept. 21st, 1949. Belgium Pat. 491,293 Oct. 15th, 1949. Switzerland Patent 48,970 Sept. 23rd, 1949. Italy Patent 456,937 September 19th, 1949. Germany Patent 829,248 September 25th, 1949. Great Britain Patent 662,219 September 27th, 1949. Argentina Patent 96,970 September 30th, 1949. Brazil Patent 39,676 December 29th, 1951. Mexico Patent 51,615 January 3rd, 1952. Other U. S. and Foreign Patents Pending.





TUPPER / Seals

air and liquid-tight, flexible covers for Tupperware Tumblers, Canisters, Wonder Bowls, Cereal Bowls and many another container of glass, metal and pottery, the contents of which it is desired to keep fresh and wholesome.

TUPPER /

FORMAL NOTICE! 9th November, 1949

EXCLUSIVE!

U. S. Patent #2,487,400

The Tupper Corporation has attained a position of leadership in this industry by incurring great expense and expending painstaking effort in the development, design, manufacture and exploitation of its many world-known products.

The Tupper Corporation further has anticipated the inevitable attacks to which leadership is subject and has taken measures provided by law to preserve the creative rights to its products, methods and design by patent protection both in the United States and abroad.

Tupper Seals for Tupperware shown in this advertisement are just a few of the forms covered in this manner and are specifically covered by U.S. Patent #2,487,400.

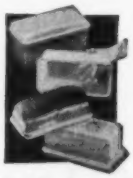
Only the Tupper Corporation, by U.S.Patent #2,487,400 has the right to make, use and vend container closures in connection with any and all types of containers throughout the United States and its territories as covered by the claims of the Patent.

Tupper Corporation will protect, according to law, the exclusive rights above granted

TUPPER CORPORATION

There's a Tupper Seal, air and liquid-tight flexible cover for Tupperware 2, 5, 8 and 12½ oz. Tumblers too, and these Tupper Seal, covers fit many other containers of metal, glass and crockery.

The Tupper Seal, air and liquid-tight flexible Pour Top cover, specially designed as a dispensing cover for specified diameters of containers holding foods such as syrups, salad dressings, catsup.



The cover of the Tupperware Bread Server which serves as a bread tray also is designed to give similar results as Tupper Seal, air and liquid-tight Flexible covers. Keeps contents fresh as no other such container.

When equipped with Tupper Seal, air and liquid-tight, flexible covers, Tupperware Cereal Bowls serve many another purpose.

The Tupper Seal, air and liquid-tight flexible cover made for Tupperware 8 oz. Tumblers also fits and is sold with all Tupperware Funnels as a base when funnels are used as storage containers.

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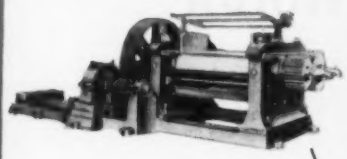

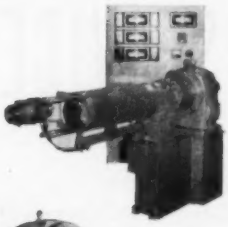

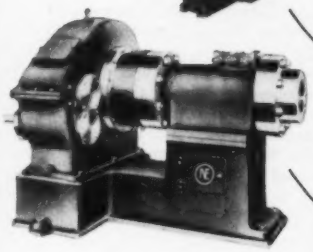

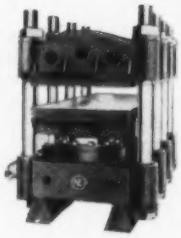

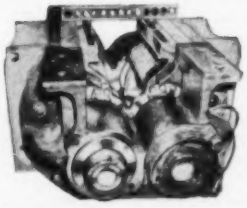

We are currently supplying the "know how" and all the equipment for processes which involve the following basic machines:

MILLS AND REFINERS

This 22" x 22" x 60" Rubber Mill is typical of National Erie heavy Milling equipment now in extensive use in the industry. Available in all sizes.

EXTRUDERS FOR PLASTICS

Advanced design National Erie units are available with all necessary equipment to form complete production processes.

EXTRUDERS FOR RUBBER

National Erie Tubers have been developed through years of experience into heavy-duty, trouble-free machines for continuous, efficient production.

HYDRAULIC PRESSES

Self-contained, oil hydraulic press and pump unit 48" x 72" for laminated plastics. Complete line of presses available from National Erie Designs.

BANBURY REBUILDING

We have an inventory of all parts for your Banbury and can give prompt service on rebuilding. If you anticipate Banbury repair work, call on us—we shall be glad to inspect your mixer and submit a detailed report of its condition, together with requirements for rebuilding.

Complete service on National Erie Equipment

NATIONAL ERIE STAFF JOINS HALE AND KULLGREN, INC.

The engineering organization of National Erie, including personnel, drawings and records, have transferred to the offices of Hale and Kullgren, Inc., at 613 East Tallmadge Avenue, Akron, Ohio, and are available to you for prompt service on your processing problems. Complete service on parts and information for all existing National Erie equipment is available.

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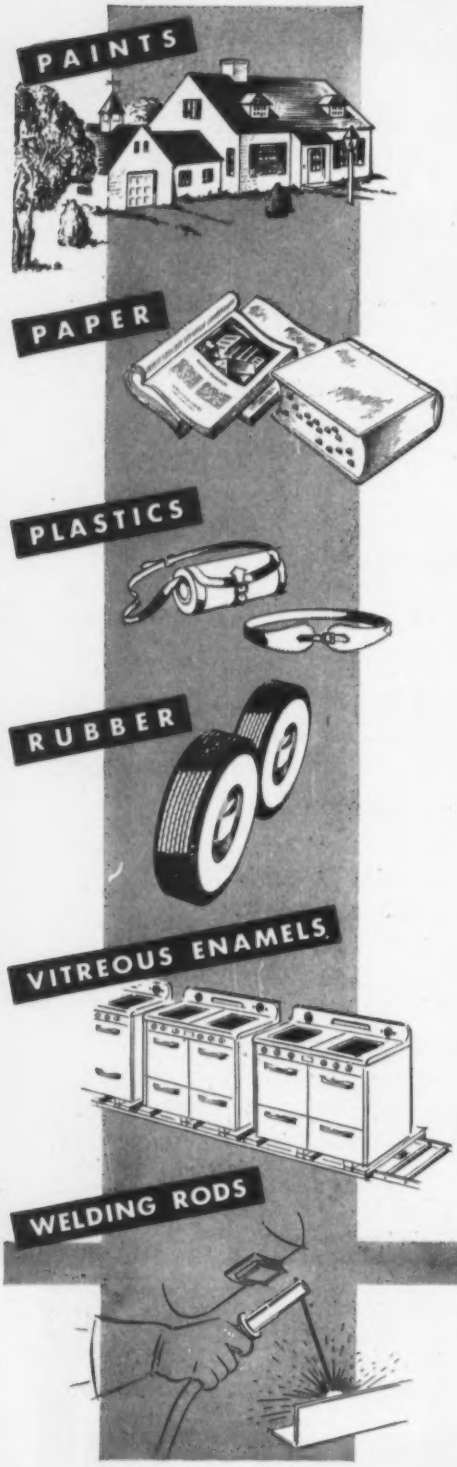

LOOK TO TITANOX FOR TiO_2 TECHNICAL SERVICE

New Applications . . .

Take them to Titanox Technical Service

Skilled technologists and the most modern facilities for research and development are available through Titanox Technical Service for the investigation of new uses for titanium dioxide and titanium compounds. The recent introduction of TITANOX-TG, prime source of *non-pigmentary* TiO_2, makes titanium dioxide available in greater quantities and in a more usable form for the manufacture of improved enamels, heat resistant coatings, glass, welding rod coatings and many other products. New fields of application are now under consideration . . . perhaps Titanox Technical Service can help you.

Improved Formulation . . .

Ask Titanox Technical Service

Long experienced in the formulation of both pigmentary and non-pigmentary titanium dioxide for use in paints, paper, rubber, plastics and ceramics, Titanox Technical Service is always available for assistance with any formulation problem. Often, these specialists can suggest a change or recommend the use of one of the newer Titanox types which may improve your product.

More Efficient Utilization . . .

Check with Titanox Technical Service

For the most efficient use of Titanox pigments, you'll find our Technical Service—with its wealth of laboratory and research data, its years of service experience—can often be helpful to you. Perhaps they can suggest a new or different Titanox product that will speed production or lower costs.

For detailed information on the advantages of Titanox Technical Service, see your Titanox representative or write to the Titanium Pigment Corporation, Dept. WA, 111 Broadway, New York 6, N.Y.

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CELLULOID	sheets, rods, tubes, ribbon
SICALOID	cellulose acetate sheets, rods, tubes, ribbon
SICOFOIL	cellulose acetate and nitrate film
SICALIT	cellulose acetate moulding powder
SICOSTIROL	polystyrene moulding powder
SICOVINIL	rigid vinyl sheets
SICALENE	polyethylene tubes and sheets for packaging
NITROCELLULOSE	for industrial purposes

Works & offices: CASTIGLIONE OLONA
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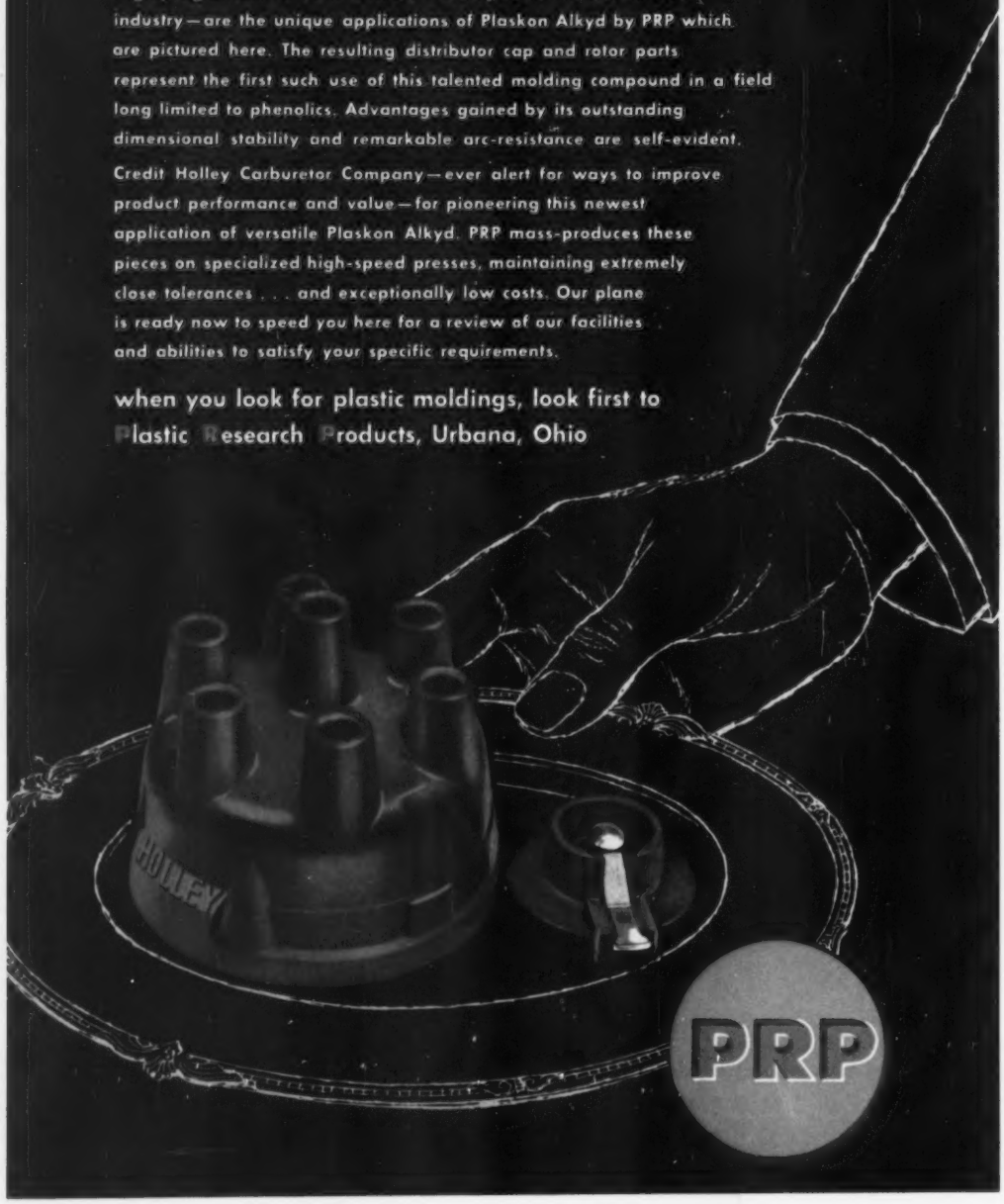
plaskon alkyd 420 forms another "first" handed to our customers

Highly significant to all industries—doubly so to the automotive industry—are the unique applications of Plaskon Alkyd by PRP which are pictured here. The resulting distributor cap and rotor parts represent the first such use of this talented molding compound in a field long limited to phenolics. Advantages gained by its outstanding dimensional stability and remarkable arc-resistance are self-evident.

Credit Holley Carburetor Company—ever alert for ways to improve product performance and value—for pioneering this newest application of versatile Plaskon Alkyd. PRP mass-produces these pieces on specialized high-speed presses, maintaining extremely close tolerances . . . and exceptionally low costs. Our plane is ready now to speed you here for a review of our facilities and abilities to satisfy your specific requirements.

when you look for plastic moldings, look first to Plastic Research Products, Urbana, Ohio



MPS-500

some things you will want to know about this new low-cost vinyl plasticizer

what it is

MPS-500 is a stabilized, chlorinated ester of a fatty acid, in which the chlorine content is controlled to give best balance between compatibility and plasticizing efficiency.

its chief advantages

MPS-500 is lower in cost than most primary plasticizers. It shows excellent compatibility with vinyl chloride polymers and copolymers, is highly permanent and flame retardant.

qualities it can impart to your product

- Flame retardance
- High resistance to water, oil, gasoline
- High permanence on heating
- Excellent electrical properties
- High tensile strength at high flexibility
- Low migration

what you can use it for

- Transparent and opaque films
- Upholstery and drapery
- Shoe soles
- Electrical insulation
- Hose covering
- Organisol and Plastisol formulations
- Softener for nitrile rubbers

BULLETIN 35 gives you properties of MPS-500; comparisons with other plasticizers; detailed test data; typical formulations and uses. Write today, on your company letterhead, for a copy.

From the Salt of the Earth

HOOKER ELECTROCHEMICAL COMPANY

HOOKER CHEMICALS

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BENZOIC ACID • CHLOROTOLUENE • SODIUM BENZOATE • CAUSTIC SODA • MURIATIC ACID • CHLORINATED PARAFFIN • CHLORINE

5 years of Nylon molding on *LESTERS* at Autograf Brush!

This gate of brush-backs, weighing 8 ounces, is molded by Autograf Brush & Plastics Co. for Stanley Home Products, Inc. on a 12 ounce Lester. It's a tough job—It must have perfect finish, fine color, and be free of porosity for bristling. But it's a routine job for Autograf. For five years they have been running nylon *regularly* on their Lesters.

The Lester Nylon Cut-off Attachment is the key to trouble-free nylon molding. Positive, *mechanical* action completely eliminates drooling. Internal heat in the spreader ups production. With 4-zone heater control, color and physical properties are consistently better.

If you are interested in top quality production of *all* thermoplastics, write for complete specifications on the Lesters—4 to 48 ounces.

Write for the Lester-Phoenix house organ, "The Lester Press".

LESTER INJECTION MOLDING MACHINES

distributed by LESTER-PHOENIX, INC., 2621-D CHURCH AVENUE • CLEVELAND 13, OHIO

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specialists in *Reprocessed* plastics

If you use reprocessed plastics, or sell your plastic scrap or have it reprocessed on a contract basis—you can rely on MUEHLSTEIN for superior service, quality and technical "know-how."

MUEHLSTEIN specializes in reprocessed plastics. Their technical staff is at your service.

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all types of virgin and scrap THERMOPLASTICS bought and sold

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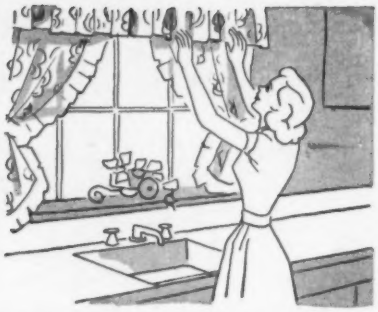
1. For high translucence. "Dutch Boy" Plumb-O-Sil C has a refractive index that closely coincides with that of vinyl chloride resin. That's why Plumb-O-Sil C assures highly translucent stocks for a wide variety of products.



2. For better color. "Dutch Boy" Plumb-O-Sil C stabilizer has no appreciable tinting strength. You get good stability in deep shades and vivid colors because Plumb-O-Sil C performs well with almost all dyes and pigment additions.

Stabilize your translucent vinyl stock with "Dutch Boy" PLUMB-O-SIL C

3. For easier dispersion. "Dutch Boy" Plumb-O-Sil C needs *no* pre-dispersion. You get heat stability with less work and trouble in processing.

If you have a special problem in stabilizing your translucent vinyl compounds, consult our technical staff. They will be glad to help you. Or write for additional information and technical data on "Dutch Boy" Plumb-O-Sil C.

"Dutch Boy" Stabilizers

PRODUCT	USE
TRIBASE (Tribasic Lead Sulphate)	Electrical and other compounds requiring high heat stability
TRIBASE E (Basic Lead Silicate Sulphate Complex)	Low volume cost insulation
DS-207 (Dibasic Lead Stearate)	Stabilizer-lubricant for sheeting, film, extrusion and molded compounds
PLUMB-O-SIL A (Co-precipitate of Lead Orthosilicate and Silica Gel)	Translucent and colored sheeting and upholstery stocks
PLUMB-O-SIL B (Co-precipitate of Lead Orthosilicate and Silica Gel)	Translucent and colored film, sheeting, belting
PLUMB-O-SIL C (Co-precipitate of Lead Orthosilicate and Silica Gel)	Highly translucent film and sheeting
DYTHAL (Di-basic Lead Phthalate)	General purpose stabilizer for heat and light. Good electrical properties
DYPHOS (Di-basic Lead Phosphite)	Outstanding for heat and light in all opaque stocks, including plastisols and organosols. Exceptional weathering characteristics
NORMASAL (Normal Lead Salicylate)	As stabilizer or co-stabilizer in vinyl flooring and other compounds requiring good light stability
BARINAC (Barium Ricinoleate)	Stabilizer-lubricant for clears

Dutch Boy* CHEMICALS

*Reg. U. S. Pat. Off.

NATIONAL LEAD COMPANY

111 Broadway, New York 6, N. Y.

CALENDER IGNORES THE CALENDAR

Gage stays accurate with calender rolls on TIMKEN® bearings

GAGE of plastic film and rubber sheeting stays accurate longer when calender rolls are mounted on Timken® tapered roller bearings instead of sleeve-type bearings.

Timken bearings hold rolls in accurate alignment. Uniform gage is maintained for the length of the sheet and for sheet after sheet. And your yield is increased because Timken bearings hold gage to minimum tolerances. You get more yards per pound of material.

Roll neck wear is eliminated with Timken bearings because there is no friction between roll neck and bearing. Overhauls are fewer. Downtime is minimized because roll necks don't need to be machined.

Timken bearings have true rolling motion and incredibly smooth surface finish which practically eliminate wear within the bearing. Precision is *maintained.*

Timken bearings are tapered in construction permitting them to take radial and thrust loads in any combination. And because of line contact between their rollers and races, there's load capacity to spare.

Take advantage of Timken bearings in your calenders, mills, refiners and mixers. For full information, write The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ont. Cable address: "TIMROSCO".

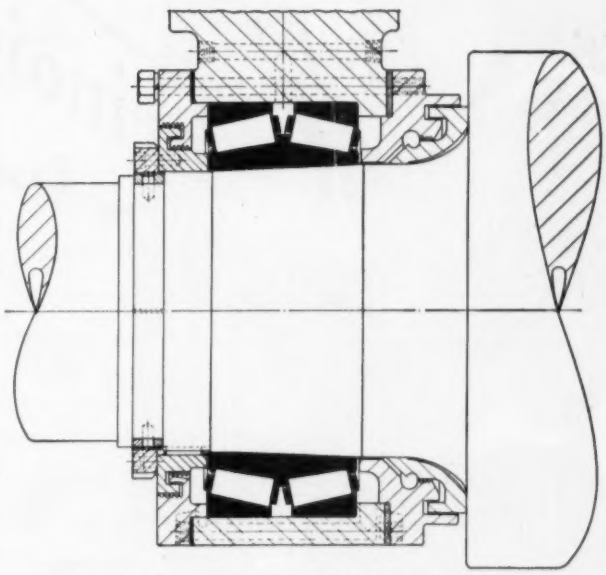


Diagram shows how calender rolls are mounted on Timken tapered roller bearings to maintain uniform gage of plastic film and rubber sheeting.

TIMKEN

TAPERED ROLLER BEARINGS

NOT JUST A BALL ◯ NOT JUST A ROLLER ▭ THE TIMKEN TAPERED ROLLER ▭ BEARING TAKES RADIAL ▯ AND THRUST ▯ LOADS OR ANY COMBINATION

Erinoid POLYSTYRENE

From the machines of one of the world's most modern plants Erinoid polystyrene goes out in sealed bags to the injection moulders, to widen and enrich the range of British plastics.

The physical properties of polystyrene—low specific gravity, inertness to humidity, resistance to temperature changes, very low electrical loss factor, high break-down voltage—make it the ideal moulding powder for a wide range of products, just a few of which are illustrated here.

Erinoid polystyrene excels in its full range of opaque, transparent and pearlescent colours.

Available in the form of moulding powder, sheet and rod

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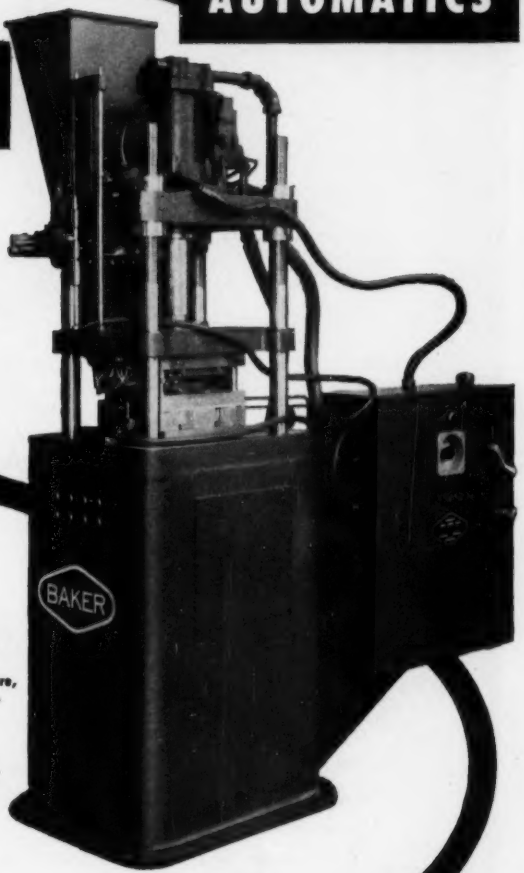
SPEED with BAKER AUTOMATICS

Up to 2400 pieces per hour with 8 cavities . . .

- **HIGH SPEED**
- **SELF CONTAINED**
- **LOWER MAINTENANCE**
- **HIGH PRODUCTION RATE**
- **ONE MAN CAN RUN A BATTERY OF 10**



Check these production figures . . .

Alkyd, 36 sec. cure, 4 sec. machine.

Alkyd, 30 sec. cure, 4 sec. machine.

General purpose phenolic, 30 sec. cure; 10 sec. machine.

Beetle, 34 sec. cure, 8 sec. machine.

Alkyd, 14 sec. cure, 4 sec. machine.

Bakelite, 60 sec. cure, 10 sec. machine, plus insert.

Alkyd, 9 sec. cure, 4 sec. machine.

Then write for catalog and full details . .

Better Machine Tools . . . Since 1867

BAKER BROTHERS, Inc., TOLEDO, OHIO

TODAY: *Low-cost, eye-appealing display packages made with acetate sheeting—alone or with other materials. The two shown here are examples of the many now produced by Robert Gair Company, Inc. . . . new packages using acetate sheeting, extruded from Hercocel A, combined with cardboard and metal foil. Here, the crystal-clear acetate permits products to be seen without distortion, while protecting them against dust, moisture, and handling.*

DESIGNED TO SELL WITH HERCOCEL®

TOMORROW: Attractive and serviceable packages of all types, tailored to fit the product and the manufacturer's pocketbook, based on molded Hercocel A or extruded acetate film or sheeting.

In these sketches our designer suggests new packaging uses for Hercocel A, designed to provide products with higher attention value on store counters and greater usefulness in the home.

Hercocel is tough, durable, and low in cost . . . can be quickly and easily molded or fabricated. Whatever your packaging problem, chances are you can solve it successfully, and at the right price, with Hercocel.

For information on Hercocel and all the Hercules services that go with it . . . including design assistance, technical counsel, and the facilities of our laboratories, write or call:

HERCULES POWDER COMPANY
INCORPORATED
Cellulose Products Department, 916 Market Street, Wilmington 99, Delaware

PERFUME
DISPLAY
PACKAGE
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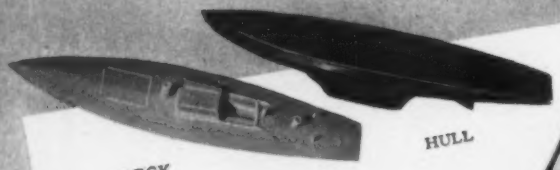
Vitamins
DISPENSER PACKAGE FOR VITAMINS
HERCULES
CELLULOSIC PLASTICS

CP52-8

HOW THOMAS TOY set sail for bigger profits!



DECK HULL

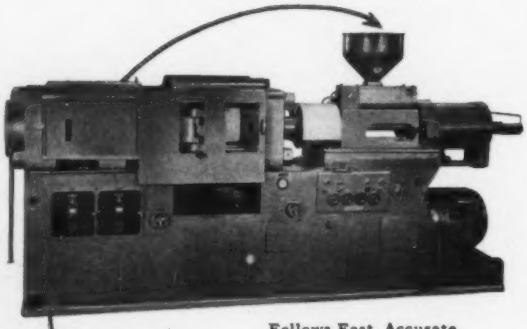
PRODUCTION DATA

	DECK	HULL
Weight	4½ oz.	5 oz.
Projected Area	78 sq. in.	78 sq. in.
Production Rate	134 per hour	90 per hour

SINK-FREE
SHRINK-FREE SEAM

The Thomas Manufacturing Corp., a leading plastic toy manufacturer, of Newark, New Jersey, molds hull, deck and trim of this sink-free sailboat at money-making speed—with a Fellows 5C-8 molding machine. The shots come fast and are so accurate, so free of bubbles, rough edges and shrinkage that Thomas Toy is able to reduce costs and assembly time to a point that permits attractive retail pricing. What's more, because the 5C-8 is designed to eliminate burning and discoloration, the plastic beauty of this high-quality item invites sales and assures larger profits.

Let Fellows Injection Molding Equipment launch you toward bigger profits too! Write, wire or phone for further information today!



Fellows Fast, Accurate, 5C-8 Injection Molding Machine with the Famous "Speed-Flo" Cylinder.

Fellows injection molding equipment

THE FELLOWS GEAR SHAPER CO., Plastics Machine Div., Head Office & Export Dept., Springfield, Vt. Branch Offices: 323 Fisher Bldg., Detroit 2 5835 West North Avenue, Chicago 39 • 2206 Empire State Bldg., New York 1 • New England Distributor: Leominster Tool Co., Leominster, Mass.

DuPont Announces "UNICEL" ND

A chemical blowing agent

for expansion of resins

"UNICEL" ND enters the expanded resin field following its sucess as a blowing agent for elastomers. Its use offers manufacturers a low-cost method for controlling density of many resins. The cellular structure of the expanded resins achieved by means of this efficient blowing agent offers many attractive possibilities in applications where insulating value or buoyance are important.

With proper formulation, volume expansion up to 1000% can be achieved. Rigid to soft flexible cellular material can be readily obtained by varying the amount of plasticizer. Acid activators are incorporated into the plastisol to permit the uniform decomposition of "Unicel" ND at a practical temperature range.

"Unicel" ND has excellent stability when stored under normal conditions. Under the influence of heat, "Unicel" ND decomposes smoothly and rapidly to form nitrogen and a solid residue.

SPECIFICATIONS FOR "UNICEL" ND

COMPOSITION ...40% Di-n-nitroso pentamethylene tetramine
60% Inert Filler

APPEARANCE ....Cream-colored powder

SCREEN SIZE.....At least 99.5% passes a No. 100 screen. (Size of opening 0.149 mm.)

FOR FURTHER INFORMATION send in the coupon below for Technical Service Bulletin No. 5. Our technical and engineering staff will be glad to advise you on specific applications of "Unicel" ND. Just write E. I. du Pont de Nemours & Co. (Inc.), Chemical and Miscellaneous Sales, Explosives Dept., Wilmington 98, Delaware.

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150th Anniversary

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Please send me Technical Service Bulletin No. 5 which describes "Unicel" ND in detail.

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make it Wellington Sears Sateen

a superior fabric for coating

Smoothness and toughness are two big reasons why Wellington Sears sateens are so often specified by the coating industry. Their high tear resistance, tensile strength and smooth weave surface insure long service life for a wide variety of good looking finished products.

Wellington Sears sateens are made up to 72 inches wide in weights of about 8 to 10 ounces per square yard. Rigid quality control in every stage of fabric production is assurance of consistent uniformity of end product.

Other Wellington Sears quality fabrics for both coating and laminating are listed at right. Many types of special constructions are also available. Whatever your fabric problem —see Wellington Sears first.

An illustrated 24-page booklet filled with valuable facts on fabric development and applications of interest to present and potential users of industrial fabrics is yours for the asking. Write for a free copy of "Modern Textiles for Industry" to Wellington Sears Co., Dept. 101K, 65 Worth Street, N. Y. 13.

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WE MANUFACTURE Virgin Thermoplastic injection and extrusion molding compounds, standard and special formulations . . . Polystyrene, Polyethylene, Acetate, Acrylics, Ethyl Cellulose, Vinyls.

- **WE BUY THERMOPLASTIC SCRAP** — all types and forms: Polystyrene, Vinyls, Nylon, Ethyl Cellulose, Polyethylene, Acetate, Butyrate, Acrylics.
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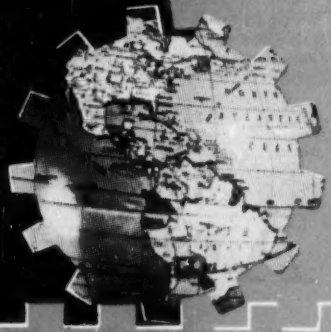
- **WE EXTRUDE** any flexible or rigid formulation which you plan, for any special-shaped Belting, Binding, Edging, Rods, Tubes, Film, Strips . . . in Polystyrene, Cellulose Acetate, Polyethylene, Vinyl, Butyrate, Ethyl Cellulose, Acrylics.

DRYCOL —offered as Gering's perfected dry coloring medium for in-plant coloring of ALL PLASTICS. No special skill or equipment needed. Standard, Special and Metallic colors available or to order.

Our service is world-wide . . . attained over the years thru eternal self-discipline for Quality, Perfection, Delivery. Consult our Technical Service Department.



Our 30 years expert know-how and large facilities: Your guarantee of complete satisfaction.

GERING *Products* INC. KENILWORTH, N. J.

More new developments in AMERICAN ANODE *materials*

Two handy ideas for new sales!

Controlled viscosity gel and plastisol simplify production!

PICTURED here are two new American Anode materials which can open up new sales fields for you. On the left you see Ameran CV-G (controlled viscosity gel). Putty-like in form, it can be hand-molded like modeling clay. No warm-up or heating is required. Articles are fused *after* removal from the mold —leaving the mold ready for immediate re-use. Ameran CV-G can be molded, cold dipped, cast, extruded or spread.

The picture on the right shows Ameran CV-P (controlled viscosity plastisol) being used for cold dipping household gloves. It may be used on vertical forms for dipping plastisol, without heat treatment of the form. Flow characteristics permit close control and uniformity of film thickness. And you get a uniform film with good elongation. Ameran CV-P may be used for cold dipping, coating, molding or casting.

The viscosity of both Ameran CV-G and Ameran CV-P is controlled—does not change in storage. Both compounds can be made resistant to oils, greases, most chemicals and acids. No solvents are needed, eliminating fire hazard. No recovery system. Wide range of colors possible, including white. You'll think of many sales-making uses for these versatile materials. For technical information, please write Department AC-6, American Anode, 60 Cherry Street, Akron, Ohio.

AMERICAN ANODE

A Division of The B. F. Goodrich Company

CRUDE AND AMERICAN RUBBER LATICES, WATER CEMENTS AND SUSPENSIONS, AMERAN RESIN PASTES, COMPLETE MANUFACTURING FACILITIES

This processing setup was developed several years ago by Farrel-Birmingham engineers, working with plastics manufacturers, to synchronize the progressive steps in the production of calendered plastic film and coatings.

Since then, many installations have been made in plastics plants. In fact, the combination has been giving such satisfactory service that it has become the generally accepted unit for this type of production.

Using this setup, one manufacturer has been able to produce, for the first time on a commercial scale, 1.7 gauge, calendered, unsupported vinyl film. The variation in accuracy of gauge of the final product is less than plus or minus .0001 inch.

Farrel-Birmingham engineers will be glad to help you select individual machines or combination units best suited to your specific requirements. Send for further information.

FARREL-BIRMINGHAM COMPANY, INC., ANSONIA, CONNECTICUT

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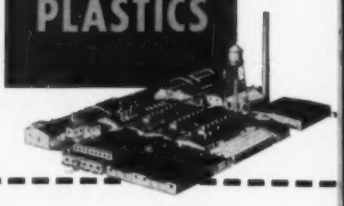

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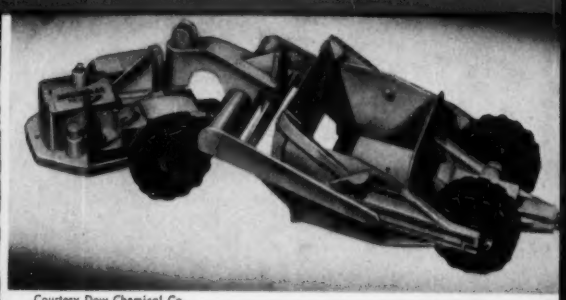
VOLUME 30 NOVEMBER 1952 NUMBER 3



Courtesy Dow Chemical Co.

Line of miniature construction toys accurately scaled with moving parts uses a styrene alloy for strength and dimensional stability

Courtesy U. S. Rubber Co.

Maze of pipe made from a styrene-synthetic rubber alloy demonstrates toughness and chemical resistance of new materials

New STRENGTH For Styrene

Copolymerization and alloying of styrene are yielding stronger and better materials for new applications. A survey of this important new field

SOME call it "styrene," some call it "polystyrene," when referring to polymerized styrene molding material. Molecularly speaking, this material is a linear polymer with varying polymer lengths, depending on the method of polymerization.

Invented in 1839, styrene polymer was not put into any commercial use until 1937, three years after the introduction of injection molding machines into the United States.

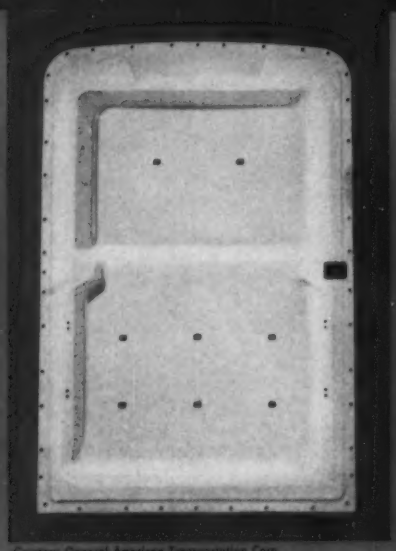
Polymerized styrene is grand stuff. Unlike previous injection molding materials, its primary form is crystal. It colors beautifully. Molded, it is slick and shiny. Its dimensional stability is good because it contains no plasticizer and is not moisture sensitive. It has excellent electrical characteristics. It molds easily. It costs the least of all thermoplastics, and it has a low specific gravity. No wonder that its sales have expanded so rapidly into housewares, radios, toys, refrigerator trays, packaging, stationery items, and a host of other things.

But styrene just isn't quite good enough for some additional applications into which its makers would like to see it move. Its deficiencies —brittleness, relatively low distortion temperature, poor outdoor resistance, lack of resistance to hydrocarbons—are slight, but serious. Up to now, large enough markets for polymerized styrene have been found in those applications in which these deficiencies are not involved. But it has been recognized for years by its makers that the material should be somewhat improved if it is to fulfill its destiny by moving into markets where better properties are required. The development of huge injection presses capable of molding up to 400 oz. per shot opened new doors to new markets for polystyrene in large and heavy molded pieces, and until recently it hasn't been able to enter those doors.

Big New Markets

Now styrene with new strength is galloping into big new markets!

There are three main methods of giving styrene new strength: a) by variations in method of polymeriza-

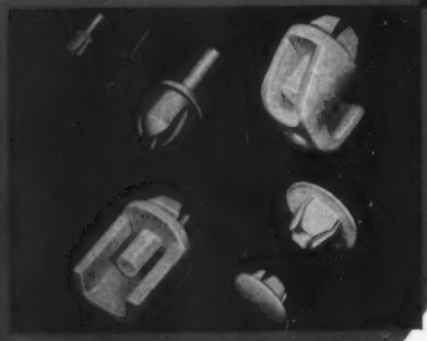


Courtesy General American Transportation Corp.

Refrigerator door interior which is injection molded from alloy has superior surface finish, solid homogeneous color, and is stable in the presence of water vapor

Courtesy Dow Chemical Co.

New Admiral model features alloy inner door panel 42½ by 28 in. with projected area of 1240 in., weighing 7½ pounds



Courtesy Dow Chemical Co.

Shelf supports are injection molded from styrene alloy for refrigerator manufacturers. Material retains toughness even when under cold temperatures

Courtesy Dow Chemical Co.

Breaker frame on Westinghouse refrigerator is molded. High percentage of elongation makes possible flexing of frame during assembly

tion; b) by copolymerizing styrene with other chemicals to obtain copolymers and terpolymers; c) by alloying polystyrene with other polymers or copolymers to produce materials in which there is no tangible chemical reaction between the components, but in which there is a mutual physical reinforcement.

Examples of the improvement of polystyrene, particularly in heat resistance, by the use of polymerization methods which permit accurate control of molecule chain length and the complete removal of unreactive monomer, are many. The first heat resistant material in commercial production, Monsanto's LX was so constituted. Koppers' type X8 is another. Dow's Styron 700, whose nature has not been disclosed, is generally regarded as still another example of improvement in material by special handling during polymerization. These improved styrenes found open to them certain markets that were closed to ordinary styrene, but important improvement was still to be made.

The fact that styrene monomer can be widely copolymerized with other unsaturated monomers to obtain other linear polymers, or with doubly unsaturated monomers to obtain cross-linked structures, points up the opportunities in copolymerization. The composition of Monsanto's Cerex, first offered in 1944, has not been disclosed, but such a product could have been made by this method. Parenthetically, it might be pointed out that Styramic HT, another Monsanto product, and DCS, produced by Mathieson Alkali Co., were not copolymers of styrene but were polymers of a styrene derivative, dichlorostyrene.

First Commercial Case

The introduction by Rohm & Haas Co. of Plexene M in 1946 was an early case of copolymerization of styrene and other monomer, and this material (which is no longer on

the market) was the forerunner of the present range of styrene copolymers. These include Bakelite's BMC-11, and U. S. Rubber's Kralastic H, manufactured by Naugatuck Chemical in producing its styrene alloys, which will be discussed later. Other copolymers include the S polymers of Standard Oil Co. of New Jersey, declared to be styrene-isobutylene, and Dow's new 767.2 material, a fabulous copolymer the nature of which is not disclosed. The "rubber" copolymers such as Goodyear's Pliolite are high styrene-butadiene in content, based on the same materials that go into GRS rubber.

Copolymers and terpolymers, while they can be custom-made to almost thermoset properties, and while they are available in almost transparent form, cost real money. And many of the markets into which polymerized styrene has to go can't stand that cost. So the styrene alloys have been developed for these markets. And here, confusion is easy. The purpose of this article is to simplify the styrene alloy picture for our readers.

Styrene Alloys

"Alloy" in this instance is a word hereby promoted by MODERN PLASTICS magazine as being more descriptive of the new styrene compounds than the adjectives "modified" and "special" used heretofore. The word has a connotation of greater strength and improved resistance and, as mentioned above, signifies a physical compounding rather than a chemical reaction. Actually the shock strength of the alloys is due to greater elasticity.

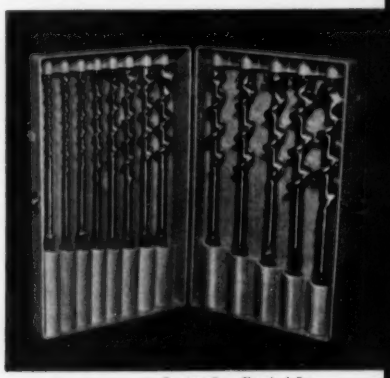
Styrene monomer may be copolymerized with butadiene to form GR-S rubber or high styrene-butadiene material. Acrylonitrile may be copolymerized with butadiene to form buna-N or nitrile rubber. Styrene monomer may be copolymerized with acrylonitrile. Then, styrene polymer may be alloyed with any of these three copolymers and the styrene-acrylonitrile copolymer may be alloyed with either of the two "rubber" copolymers.

Usually the styrene butadiene copolymer is alloyed with styrene polymer and acrylonitrile butadiene copolymer is alloyed with the styrene acrylonitrile copolymer. Usually, also, the two-copolymer alloys are somewhat superior to and more expensive than alloys containing a major portion of straight styrene polymer.

If the material alloyed with styrene polymer is styrene-butadiene, the completed alloy will have chemical properties quite similar to polystyrene, but will have greater elongation and impact strength, although tensile and flexural strengths are lower. The chart on page 95 gives the properties of a wide range of copolymers and alloys of styrene as compared to those of straight polymerized styrene.

The styrene alloys are a notable exception to the old principle that a chain is only as strong as its weakest link. The alchemy of these materials creates a balance of properties whereby a little is lost and a great deal gained from the properties of each of the materials going into the compound. And progress in the past few months has been so rapid that some of the alloys are available at 36½¢ a pound, or only 1¢ over the price of polystyrene.

In general, the alloys show a somewhat lower tensile strength, but about 10 times as high an elongation as polystyrene. Impact



Courtesy Dow Chemical Co.

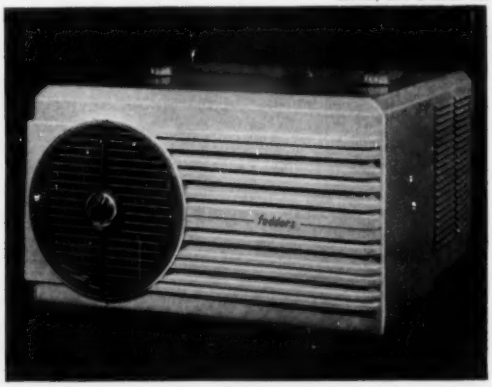
Rugged package fully protects the sharp cutting edges of wood bits. The use of alloys in the packaging field has just barely started

Flashlights molded of tough alloy are built to take rugged wear and still retain other properties of plastic

Courtesy Monsanto Chemical Co.

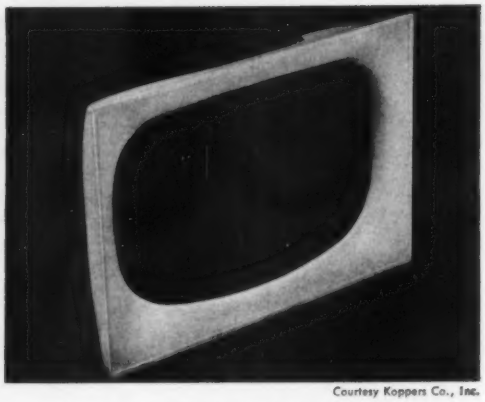
Ability of styrene alloys to stand up in large-piece molding fits it for molding the louvres and housings of room air conditioners

Courtesy Dow Chemical Co.



Courtesy Artwire Creations, Inc.

In household sink drain tray, high impact alloys have their place. White color is homogeneous, chemical resistance good, weight low



Courtesy Koppers Co., Inc.

Shield inserted around television picture tube uses alloys to permit accurate control of opacity, color, and diffusion of light

Courtesy Bakelite Co.

Colorful dishes molded from styrene copolymer are light in weight, resist breakage, staining, attack by foods, soaps and detergents

strength has been multiplied by three. They generally have somewhat less heat distortion temperature than polystyrene, and they are slightly softer than that material. The first of the alloys, and the one with which new applications were pioneered, was Dow's Styron 475. Here the requirement was for a material which could stand up to large-area molding in relatively thin section for refrigerators, radio and television applications. The material sells in refrigerator white and a limited color range at 41¢ a pound. At the same functional and economic level is Monsanto's LHN material, Koppers' MC 301, Bakelite's BMSQ151, and Catalin's High Impact.

At a lower functional level and naturally in a lower price range (36½¢ per lb.) are Dow's Styron 777, Koppers' MC 401, Monsanto's LHA, and Catalin's Medium Impact.

Recently, a new type material by Koppers' MC-409, was introduced which combines improved toughness with improved heat resistance. ASTM heat distortion temperature test values as high as 198° F. have been obtained on this MC-409. In the 36½¢ per lb. alloy range are also a new formulation by Gering in 12 standard colors.

Three special formulations in black only are available, expecially for the extrusion of pipe and molding of pipe fittings: Koppers' MC 185, Bakelite's BMSQ152, and Kralastic B, all selling at different prices. In a higher price and properties bracket are Bakelite's BMSQ 155 selling at 58¢ per pound and Kralastics B, F, D, J selling at 65¢ per lb. in molding material form.

Readers who have noted the lead article in MODERN PLASTICS for July 1952, p. 71, wherein we discussed the sheet copolymers, can be unconfused by remembering that Dow's 475 sheet is functionally similar to Styron 475 molding and extrusion material. Almost any of the alloys have formable sheet possibilities, and any of the copolymers may be alloyed.

Properties Compared

While the chart on page 95 gives a comparison with the basic engineering properties of the stronger styrenes, there are variations and nuances that make a more intense study necessary before selection can be made for any particular application. There are also particular molding problems involved.

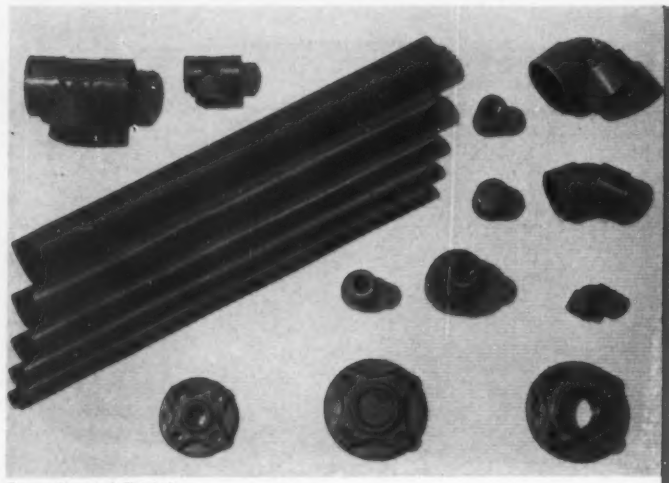
In the unmodified state, clear with an occasional yellow cast, and produced for molding and extrusion in a huge variety of transparent, transluscent and opaque colors, Bakelite's BMC-11, copolymer of styrene and acrylonitrile, offer superior chemical and weathering resistance, as well as mechanical properties. It has a chemical resistance similar to polystyrene with respect to mineral acids, alkalies, higher alcohols, and vegetable oils, but is superior to polystyrene in resistance to motor oils, gasoline, and carbon tetrachloride. Solvents are acetone, methyl ethyl ketone, cyclohexone, ethyle acetate, butyl acetate, and chloroform. BMC-11 has much greater tensile and flexural strength than polystyrene, but on a notched Izod impact test appears quite similar. This material is a natural for monofilament extrusion, for rattan-type application, for outdoor use, and for use in the food, drug,

Properties of the Stronger Styrenes

Material Maker	Molding Compound	Copolymer	Alloy	Tensile Strength p.s.i.	Flexural Strength p.s.i.	Modulus of Elasticity p.s.i.	Distortion Temperature °F.	Chemical Resistance	Dielectric Constant 60 Cycles	Weather Resistance	Rockwell Hardness	Clarity	Colors
Average of All Makers	Polymerised Styrene			6,000 to 10,000	8,000 to 12,000	400,000 to 500,000	150 to 200	Attacked by Oxidising Acids & Chlorinated Hydrocarbons	2.45 to 2.65	Poor	M-70 to M-80	Transparent to Opaque	Unlimited
Koppers Co. Inc.*	MC-301		√	4,000 to 5,000	6,000 to 7,000	310,000 to 340,000	180	"	2.55 to 2.6	Poor	M-20 to M-30	Opaque	Unlimited
Koppers Co. Inc.*	MC-185		√	4,500 to 5,500	6,000 to 7,500	350,000 to 380,000	180	"	2.55 to 2.6	Poor	M-20 to M-30	Opaque	Unlimited
Koppers Co. Inc.*	MC-401		√	5,500 to 6,500	9,500 to 10,500	410,000 to 450,000	190	"		Poor	M-60 to M-70	Opaque	Unlimited
Koppers Co. Inc.*	MC-405		√	5,500 to 6,500	9,000 to 10,000	410,000 to 450,000	175	"		Poor	M-60 to M-70	Opaque	Unlimited
Koppers Co. Inc.*	MC-409		√	5,500 to 6,500	9,500 to 10,500	410,000 to 450,000	195	"		Poor	M-60 to M-70	Opaque	Unlimited
Gering Products Inc.	Medium Impact Styrene		√	7,000	13,500	400,000 to 500,000	190	"		Poor	M-62	Translucent to Opaque	Unlimited
Bakelite Co.	BMC-11	√		9,000 to 12,000	13,000 to 17,000	400,000 to 600,000	190 to 205	Attacked by Chlorinated Hydrocarbons and Alcohols	2.9 to 3.4	Good	M-85 to M-87	Transparent to Opaque	Almost Unlimited
Bakelite Co.	BMSQ-151		√	3,500 to 4,500	6,000 to 6,500	300,000 to 340,000	176	Same as Styrene	2.79 to 2.85	Poor	L-45 to L-60	Opaque	Wide Range
Bakelite Co.	BMSQ-155		√	4,500 to 5,000	6,000 to 7,000	200,000 to 250,000	181 to 185	Same as Styrene	2.67 to 2.73	Poor	L-45 to L-60	Opaque	Wide Range
Dow Chemical Co.	Styron 475			4,500 to 5,500	No Failure	300,000 to 330,000	150 to 185	"	2.55 to 2.60	Poor	M-35	Translucent	All Opaques and Translucents
Dow Chemical Co.	Styron 777			6,000 to 7,000	11,000 to 13,000	450,000	150 to 190	"	2.52 to 2.58	Poor	M-65	Translucent	All Opaques and Translucents
Dow Chemical Co.	Styron 700			7,000 to 8,000	12,000 to 15,000	470,000	165 to 225	"	2.50 to 2.60	Poor	M-75	Transparent	Unlimited
Monsanto Chemical Co.	Lustrex LHN		√	4,700 to 6,000	7,500 to 9,000	340,000 to 360,000	190 to 196	"	2.55 to 2.70	Poor	M-10 to M-20	Opaque	Unlimited
Monsanto Chemical Co.	Lustrex LHA		√	6,000 to 7,600	9,000 to 12,000	400,000 to 500,000	185 to 194	"	2.45 to 2.65	Poor	M-65 to M-75	Translucent	Unlimited
Naugatuck Chemical	Kralastic B		√	5,000	9,000	300,000	186	Attacked by Ketones and Aromatic Hydrocarbons	4.8	Fair	R-96	Opaque	Unlimited in Opaques
Naugatuck Chemical	Kralastic D		√	6,000	11,500	390,000	193	"	3.4	Fair	R-108	Opaque	Unlimited
Naugatuck Chemical	Kralastic F		√	4,000	8,500	300,000	185	"	4.2	Fair	R-92	Opaque	Unlimited
Naugatuck Chemical	Kralastic H	√		10,000	16,000	510,000	209	"	3.0	Good	R-122	Transparent	Almost Unlimited
Naugatuck Chemical	Kralastic J			3,000	5,500	170,000	172	"	4.0	Fair	R-62	Opaque	Unlimited

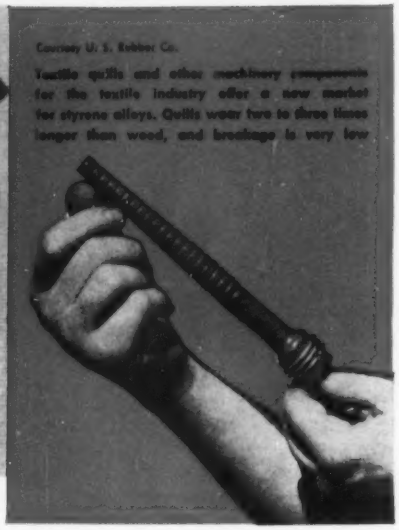
The following are ASTM test designations and units applicable to test values:
Tensile Strength — ASTM D 638-49T — Units — p.s.i.
Flexural Strength — ASTM D 650-42T — Units — p.s.i.
Modulus of Elasticity in Flexure — ASTM D 650-42T
Heat Distortion Temperature — ASTM D 648-45T — Units — °F.
Dielectric Constant — ASTM D 150-47T
Rockwell Hardness — ASTM D 785-44T

* All values on alloys are tentative and typical. Impact strengths of these materials are not here reported, due to the wide differences in test specimen sizes used. Readers are referred to the material makers for this information.



Courtesy Naugatuck Chemical

Alloy combines good chemical resistance with strength in flexure in extruded pipe and injection molded pipe fittings. Dimensional stability under varied temperature is also a factor



Courtesy U. S. Rubber Co.

Textile quills and other machinery components for the textile industry offer a new market for styrene alloys. Quills wear two to three times longer than wood, and breakage is very low

and the cosmetic packaging fields.

BMC-11 should be injection molded with a mold temperature of between 180 and 195° F., a heating cylinder temperature of 350 to 525° F., and a hydraulic pressure between 1500 and 3000 p.s.i. As with other copolymers, the finish of molded pieces is generally superior to that of alloy parts. Polystyrene is superior to BMC-11 electrically.

Naugatuck's Kralastic H is another styrene acrylonitrile copolymer offering superior chemical resistance, an extremely high heat distortion point, and greater dimensional stability than can be obtained in straight styrene polymers and blends.

The alloys of styrene offer greater strength because of greater elongation imparted by the "rubber" content. The alloys containing acrylonitrile offer superior chemical resistance and weather resistance to those that do not contain it. Further, the weather resistance of many alloys may be improved by the use of fillers such as titanium dioxide.

Design for Molding

Molders who are looking for a simple cycle, heat, and gate design formula for the styrene alloys are just out of luck! The variations in molding properties of the alloys now on the market are quite as extensive as the variations in their physical and chemical properties and the variations in their prices. Some of them can be shot into pin-point gated molds used for standard polymerized styrene; others need quite large gating. Some require heated molds, some do not.

It is very difficult to arrive at any general directions for molding conditions, but judging from current literature by the material makers, a mold temperature average would be between 150 and 170° F. For large area pieces pre-plasticization is almost a must, using temperatures as high as 500° F. in pre-plasticizer cylinders, and with heats of from 375 to 500° F. in injection cylinders. Pressure will depend on the alloy being molded, and the range is from 3000 p.s.i. to 25,000 p.s.i.

Some of the alloys are more versatile than others as far as molding conditions are concerned, but high mold temperatures and high pressure with short cycles are generally desirable for the production of moldings with good surface gloss, although in some cases high mold temperatures are a deterrent to easy removal of pieces from the mold. With adequate channeling in a mold and a high rate of circulation of the temperature control medium, a mold may be operated at a relatively high surface temperature without undue lengthening of cycle. Furthermore, this accurate mold temperature control makes possible moldings of superior dimensional stability at elevated temperatures with a minimum of cracking, with improved surface gloss, and offering better control of mechanical properties.

Assembly of Molded Parts

In general, for assembly operations molded styrene alloys may be glued with adhesives similar to those used for polystyrene, but a range of new adhesives for the alloys is being developed, and the advice of the material maker should be taken in all cases. Also under development by several manufacturers are weather-resistant coatings for the molded alloys, which may be expected to further increase their market potentialities.

Now that we have them or can have them, what are we going to do with the alloys? The high price copolymers, of course, at their higher price are finding specialized markets; the alloys can't afford to be special.

Think of every place where the ease of molding, electrical proper-

ties, dimensional stability, and economy of polystyrene would be an advantage, but where it has lacked toughness in thin sections, where it has crazed—and you have a market for the alloys.

The alloys have toughness, fair rigidity, dimensional stability, relative ease of molding, chemical and stain resistance, and low specific gravity. They do not have transparency, although a complete color range is available in opaque materials. In some cases they do not allow for super-smooth molded finish, although this condition is improving day by day. Except where acrylonitrile is involved, their chemical resistance is in no way superior to polystyrene. But in the blending of the alloys lies the early possibility of achieving remarkably improved characteristics. Furthermore, since most of them are adaptable to the production of vacuum formable sheets, the economics of their application can be significant.

In Refrigerators

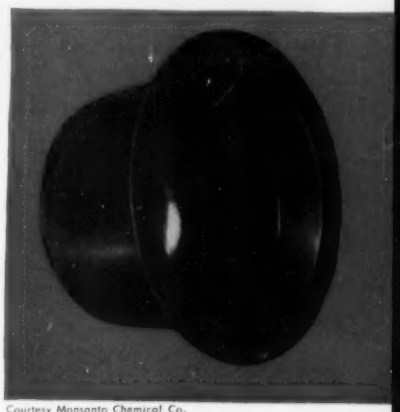
First of all, the refrigerator field has taken on the styrene alloys in both injection molded form and in vacuum formed sheet. This provides advantages of low cost and fast operation to parts formerly made by slow processes, yet parts in which polystyrene would not be satisfactory due to lack of impact strength, crazability, etc. A good example is the production by several molders of injection molded refrigerator door interior panels, chiefly out of Dow 475 and Koppers MC-405 materials. The largest of these panels, molded by Plastics Div., General American Transportation Co., has a projected area of 1800 square inches. In appearance, its surface is declared to be superior to that of any obtained from spraying synthetic enamels on laminated paper door liners.

The injection molded panels are a solid homogeneous color, eliminating all possibilities of damage to appearance by scratches and mars. They are 100% stable in the presence of water vapor. No finishing problem is involved. They can be produced twice as rapidly as molded laminate doors, and they require no blanking or piercing after molding, so that the tooling costs per unit are considerably lowered. There is a saving in weight, a saving in storage costs, and there may even be a saving in material costs.

In addition, the flexibility of design permitted by the use of molded alloy permits greater ease in the manufacture of difficult contours and shapes, allows an opportunity to vary thicknesses in different areas to satisfy load conditions in those areas, and permits the combining of several different parts into one injection molding.

Several refrigerator companies are currently in pilot production with this type of application. The low thermal conductivity of the alloys plus their toughness open to them a natural market in breaker strips, evaporator trays, and other parts of refrigerators and freezers. It may even be expected that one day a complete houeshold refrigerator interior will be molded of styrene alloy.

In television and radio, the alloys have a clear road ahead, particu-



Courtesy Monsanto Chemical Co.

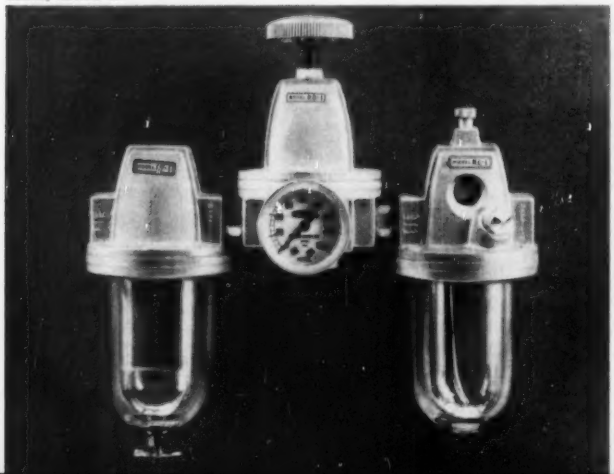
Where television tube projects out behind set, protection is provided by injection molded alloy cap, combining toughness and stability of material

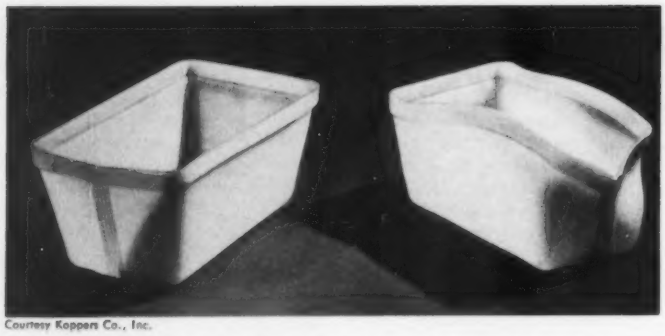
Knee desk for airplane pilots is made of styrene alloy because of light weight and shock resistance. Logs, charts, and plot cards are held in place by heavy springs

Courtesy Koppers Co., Inc.

Styrene copolymer (not alloy) is used in filter-regulator-lubricator for air-driven equipment which required both toughness and transparency. Unit stands temperatures to 125° F., air pressure of 150 p.s.i.

Courtesy Bakelite Co.





Courtesy Koppers Co., Inc.

High-heat modified styrene alloy box is shown on the left and ordinary polystyrene box on the right. Results demonstrate reaction of each to application of high heat

larly since it is possible to vacuum form a sheet alloy into a case, a tube mask, or some other part having short run, and later translate the design into injection molds for long runs.

In battery cases, where polymerized styrene will do for normal application, the alloys at very little more cost will take abnormal punishment, and are therefore now moving into use.

Already accepted in drawn sheet form for station wagon roof rails, side seat panels, instrument panels, and fender well liners in the automotive field, the styrene alloys are being studied for numerous injection molded applications in that industry.

In many applications such as carrying cases and luggage, the vacuum formed sheet alloys will be linked up with injection molded styrene alloy parts to form complete products, expecially where mold costs for relatively short runs are a major factor.

Brush handles are waiting for the alloy treatment. Low cost, plus reasonable chemical resistance, plus impact strength, is the requirement; and it appears that the styrene alloys will overcome this problem in some cases. The same thing goes for cutlery handles, for which field high heat resistant alloys are being specially developed.

Mentioned above was the pipe field, where continuous oil and chemical resistance plus light weight gives the acrylonitrile-containing styrene alloys new opportunities never available to straight polystyrene. Special formulations have been developed for this market.

Tote boxes, trays, and similar items have been formed from sheet alloys for some time. Now for long runs the injection molded versions are coming in. And new possibilities are opening in the furniture field, where the dimensional stability of the alloys equals that of polystyrene, yet the impact is so greatly improved that a plastic furniture drawer is entirely practical.

Where the molded product takes abuse, as in bobbins and spools for the textile field, the alloys can do things polystyrene could never do. The injection molding process lends an economy to the fabulous runs involved; the chemical and heat resistances are satisfactory.

Fountain Pens

To the styrene-acrylonitrile copolymers, and to alloys in which acrylonitrile is a major component, the fountain pen field offers some new opportunities. Polystyrene has not been successful in fountain pens mainly because the pen repair stations traditionally insist on using carbon tetrachloride to clean them. The styrene-acrylonitrile copolymers and alloys resist carbon tet.

Because of impact strength, there is a natural desire on the part of molders and material makers to push the alloys into outdoor applications. Here again some acrylonitrile formulations can offer weather resistance remarkably higher than that of polystyrene, and the "rubber" formulations are rapidly being improved to serve this big range of markets. Coatings at present appear to be the general answer, and where they have been tried have been quite satisfactory.

The electrical field, in which polystyrene would be good if it were not so shatterable, is open to the styrene alloys. Telephone parts, plugs, switches, terminal blocks, and many other items can be satisfactorily produced from one or the other of the many alloys available.

Toilet seats, hampers, and even basins and bathtubs are distinct possibilities. Basins and hampers are today being vacuum formed from styrene alloys, and all that is needed are long-run orders to justify injection molding.

The alloys of styrene are adaptable to injection molded phonograph record work, where non-breakable sound records of high fidelity and excellent wear characteristics are now being made at relatively low material cost. When it is considered that it is possible to produce from 20,000 to 30,000 records by injection molding from one set of matrices, as compared with possibly 1000 records per set of matrices by compression molding, and when it is remembered that material price is an important factor in the profits of the record manufacturers, the growing importance of the alloys will be recognized.

Still Larger Markets

The above-mentioned markets are all under development; but even larger ones are still wide open. The stronger styrenes will soon move into machine housings, baseboards, furniture trim, conduit, machine parts, stair nosings—and can quite conceivably become components of pre-fabricated wall boards, flooring tiles, and many other big volume items.

In addition, refinements of these present improved materials are being made from day to day; other copolymers are coming out of the laboratories and into pilot production; new alloys are being added to the list.

So some will call them "special styrenes." Some will call them "modified polystyrenes." Some will even call them "gum plastics." And some will call them "alloys." They'll take no markets away from polymerized styrene that this material deserves. They, with the copolymers, can add at least ⅓ to the existing markets for styrene plastics.

Greater strength means greater sales!

Conversion of vaporizer from porcelain to plastic construction produced light 3-lb. unit; housing, cover, and handle are phenolic

Medicant cap (center) is also molded of phenolic; the heating tube, which plugs into base, is molded of macerated cotton filled melamine

From Porcelain to Plastics

Redesigned vaporizer for home use has rugged parts made of molded phenolic, melamine, and laminates; unit is lightweight and attractive

NOT so many years ago, it was customary to press the family tea-kettle into emergency service to furnish steam for relief of the discomfort of colds, croup, or bronchial ailments. Today, new compact, electrically heated vaporizers, many of which make extensive use of plastics materials, are the modern method.

Recently The Hankscraft Co., Reedsburg, Wis., a leading supplier of nursing bottle sterilizers, bottle warmers, and related equipment, decided to redesign its Vapor-Master automatic electric vaporizer and humidifier to obtain lighter weight, improved appearance, and better performance. Seeking to eliminate certain shortcomings of the previous unit, constructed essentially of cast porcelain, Hankscraft engineers made a careful study of plastics materials to see how they could be most advantageously employed in such a device. Working closely with them on parts design were engineers of The Richardson Co., Melrose Park, Ill., which produces the plastics components used in the Model 1082-B Vapor-Master.

Seven Plastics Parts

The new model is virtually 100% plastics and has seven major plastics parts. Four are compression molded of phenolic material, one of fabric filled melamine, and the remaining two are fabricated from selected types of Insurok laminates. As a result of the changeover to plastics, the total weight of the vaporizer has been reduced from well over 4 lb. to only 3 pounds. The all-plastics model is also sturdier, more attractive in appearance, and more efficient in operation. It can be assembled more efficiently because of the closer tolerances possible with molded plastic parts.

The generous 3-qt. water capacity of the Vapor-Master enables it to operate continuously for as long as 6 or 7 hours. It begins producing steam within four or five minutes after being plugged in, being so designed that only a small volume of water is heated at a time. The heating principle employed depends upon passage of electric current between two closely spaced metal plates or electrodes, with the water itself used as the conducting medium. This arrangement insures that the device will shut itself off automatically when the water level drops below the electrodes.

The earlier porcelain model operated in a similar manner but the relative brittleness of the material rendered the device highly subject to breakage in shipment and use. In addition, small fractures in the porcelain parts, which might lead to failure in service, could not always be detected during assembly.

Impact Phenolic Used

Largest of the plastic parts in the new model is the base or reservoir, compression molded of black Bakelite BM 13080 phenolic material. This is an improved impact type material widely used in the molding of washing machine agitators

and other units which must withstand prolonged contact with water without damage. It produces a lightweight base, virtually unbreakable under normal service conditions.

This component, standing approximately 5½ in. high, measures 10 in. long by 6¾ in. wide at the widest point, and has an average wall section of about ⅛ inch. Of the four vertical ribs on its inside surface, three are cored and later tapped to receive bolts which secure the cover in place. On the lower end, the same ribs are cored for the insertion of protective rubber feet.

At the smaller end, the base has a circular well in the bottom surface into which the heating element or tube is inserted. This is cored with two openings where the electrical contacts project through from the lower side of the base, and a side opening for the electric cord. The open rim of the base has a molded lip which imparts added strength to the part and insures a close fit with the cover. At the manufacturer's plant, the outside walls of the base are finished in blue with a baking type enamel and a decalcomania name plate is applied. The low heat conductivity of the plastic base retains the heat of the water and prevents it from becoming dangerously hot on the outside.

Laminate Insulator

A circular insulating disk punched from glass cloth-melamine Insurok laminate fits into the bottom of the well. It has openings for the two metal prongs or contacts at the lower end of the heating element tube and another opening in the center through which a pointed projection of the tube passes when it is inserted in position in the base, providing a more secure mounting. This Insurok laminate part provides high strength, rigidity, and heat resistance. Its high dielectric strength and resistance to tracking prevent short circuiting.

The heating element or tube is compression molded of macerated cotton filled melamine. This extremely sturdy component, 5½ in. in length and having a maximum outside diameter of 2¾ in., must withstand alternating cycles of boiling and cooling within the tube. The plastic specified for this part combines high heat resistance and low water absorption. Its arc resistance prevents carbon tracking which might result in short circuits when water supply is exhausted.

Two openings molded through the closed end of the tube provide a mounting means for the metal electrode plates. The bolts which anchor these plates in the bottom of the tube extend through it, forming the prong-type contacts described in an earlier paragraph. A small opening drilled through the side wall of the melamine tube, near the bottom, permits water to move into the heating unit automatically from the reservoir to maintain a constant supply of steam.

In order to provide control of the steaming rate and to adapt the operation of the vaporizer to hard and soft water, it is necessary to vary the amount of current passing between the electrodes. This adjustment is accomplished by means of a small plate punched from paper-base phenolic Insurok laminate, which replaces a three-piece assembly. This material is stable under heat, maintains its high strength and rigidity, and has very low moisture absorption. The adjustment plate, riveted to the lower end of a metal rod, fits vertically between the electrodes and may be raised or lowered at will, producing a variable dielectric barrier. The perforated ceramic plate through which the adjustment rod passes is secured near the top of the heating tube by means of bolts which engage tapped threads at the top of two vertical ribs inside the tube.

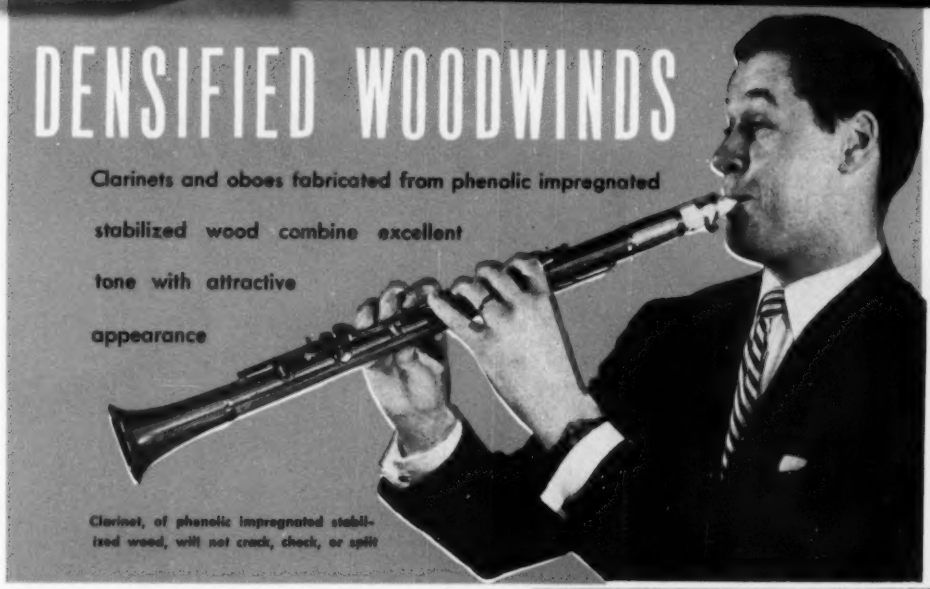
The three remaining plastic parts of the Model 1082-B vaporizer include the cover, handle, and medicament cap, all of which are compression molded of Durez 14900 phenolic. This material combines excellent shock resistance and light weight with water resistance and the ability to withstand elevated temperatures. The cover, largest of the three pieces, is designed with a circular opening at the smaller end through which the medicament cap is inserted. It is molded with three openings around the outer edge, through which bolts pass to fasten it to the base, and two other openings where the handle is similarly assembled. The attractively styled handle provides a secure grip and will remain comfortably cool to the touch at all times.

The medicament cap is molded with a ⅛ in. opening through which steam from the heating tube is directed. In its top surface is a half-moon shaped depression into which tincture of benzoin, oil of eucalyptus, or other drug may be poured so that the steam picks up the medicament vapors for more effective relief of the patient. This plastic part does not actually come into contact with the phenolic cover, but is made with a skirt which fits down inside the heating tube and concealed ribs which rest directly on the top edge of the tube. This arrangement permits the cup to be rotated horizontally to direct the steam.

Additional plastic parts of restyled vaporizer include glass cloth-melamine disc (in well of phenolic base) and a paper-base phenolic laminate adjustment plate (lower right)

DENSIFIED WOODWINDS

Clarinets and oboes fabricated from phenolic impregnated stabilized wood combine excellent tone with attractive appearance



Clarinet, of phenolic impregnated stabilized wood, will not crack, check, or split

NOT every clarinetist can expect to become another Benny Goodman, but all of them appreciate the fact that instrument quality plays a major part in their musical progress. The tonal quality of a clarinet, like that of any other musical instrument, can be no better than the materials and workmanship that go into its construction.

In its continuing effort to keep pace with modern materials and methods while maintaining its reputation for quality musical instruments, Pan-American Band Instruments, a division of C. G. Conn Ltd., has conducted exacting tests of densified, stabilized wood for use in certain types of woodwinds. As a result of this research program, Pan-American is now offering two new instruments—a clarinet and an oboe—constructed of this material. These "Violin Finish" woodwinds, so called because their handsome grained surface resembles that of a fine violin, combine excellent tone quality with attractive appearance and unusual durability. Though on the market only a short time, they have already won the endorsement of many leading clarinetists.

Photos courtesy Bakelite Co.

Quality workmanship characterizes this clarinet made of densified wood. Mirror-like finish of the wood will not wear off in service

Special Compreg

In the production of these new instruments, Pan-American utilizes a special super grade of compreg made by Parkwood Laminates, Inc., Wakefield, Mass. Supplied to the manufacturer in the form of sheets or blanks, the material consists of specially selected birch veneers, impregnated with Bakelite phenolic resin under carefully controlled conditions and compressed under high pressure into solid sheets approximately half their original thickness. Many months of coordinated testing by Pan-American and Parkwood lay behind the perfection of a grade of compreg which would satisfy the exacting requirements of this application.

Resistance to cracking and checking is one of the fundamental requirements of a quality clarinet. Such resistance is needed because

(*Continued on p. 206*)

Durable, stylish case for the clarinet and oboe is made of glass fibers laminated with polyester resins

4 WAYS

Official U. S. Navy photo

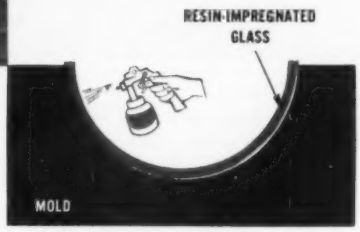


Fig. 1 (right)—Simplified sketch of single female mold method of producing plastic boat hulls. Resin may be applied to glass reinforcement by spraying, by brush, or by pouring. Fig. 2 (above)—One of the reinforced plastic landing boats produced by open mold method

FOR the past several years, various units of the Defense Department have spent a substantial amount of money in the development of techniques for the construction of reinforced plastic boats. These developments have been aimed at improving the country's preparedness and at reducing the cost of maintaining the many thousands of boats constantly in use by the Armed Forces.

Although these developments have been aimed primarily at advancement in military equipment, they have had considerable significance to the civilian industries involved. The money which has been spent has been secured from taxes—yours and mine. The following report will therefore describe the boat building methods which are available and the various features and advantages which may be of interest and benefit to commercial concerns.

The Bureau of Ships became genuinely interested in the possibilities of reinforced plastics for boat construction during World War II. By 1946, the interest had progressed to a point where two contracts were placed for the development of production techniques for building a 28 ft. personnel boat. These two contracts, plus a certain amount of development and procurement since that time, have contributed greatly to the advancement of the plastic boat building industry.

In discussing these various methods, the term "glass" is used to mean fibrous glass cloth or mat which is used to reinforce the resin in the plastic boat hulls. All methods can, and often do, make use of either or both glass cloth and mat.

Four basic methods of molding reinforced plastic boat hulls either are being used or have promise of use. These are commonly referred to as the hand lay-up method, the bag method, the injection method, and the matched die high pressure method. Both the hand lay-up and the bag methods make use of a single mold and have certain other features in common. Therefore, they will be treated separately from the injection and the matched die high pressure methods, which make use of two matching molds.

Single Mold Methods

The methods using a single mold may employ either a male or a female mold. The choice depends on several factors—which surface of the part requires the best finish, the complexity of the part, undercuts, and other fabricating considerations. A female mold is most often used to produce a boat hull in an upright position. The glass is placed in the mold by hand, usually in a dry condition. It is tailored to size and laid in place one layer at a time. Each layer is wet with catalyzed resin by spraying or pouring before the next layer of glass is laid in place. When the resin is applied, every effort is made to distribute it uniformly and to eliminate entrapped air. Air is removed and the layers of glass are placed in close contact with one another by hand rolling or squeegeeing during the lay-up process. When the lay-up is complete, it is ready either for curing into a finished piece in the case of the hand lay-up method, or for the application of a flexible pressure member in the case of the bag method.

In some cases, glass materials used in the single mold methods are impregnated with resin immediately prior to placing the glass in the mold. Certain boat builders use simple

OF BUILDING PLASTIC BOATS

The man who has headed up the development of reinforced plastics boats for the U.S. Navy's Bureau of Ships here reports on the advantages and disadvantages of the methods used to date

by JOHN B. ALFERS

dip-type treating equipment. The wet resin-treated glass is then tailored to size and laid into the mold as is described above for the dry material.

Glass materials impregnated with resin by commercial treaters also are available. Boat builders can obtain such materials with either dry or tacky surfaces. These materials are produced in equipment which provides many advantages not generally available at the small plastic boat builders' plant. As the demand for these high quality pre-impregnated materials becomes greater, boat builders may install the necessary treating equipment. The advantages of using first quality, pre-impregnated, glass-resin materials over other methods of treating the glass with resin are cleanliness of operation, high glass content, very accurate resin distribution, no resin migration, and adaptability to sandwich constructions. The resin-impregnated glass materials have one disadvantage at present of possessing a comparatively high cost.

Hand Lay-Up Method—In the hand lay-up method, Fig. 1, the glass-reinforced resin is caused to cure after it has been placed in the mold and pressed in place as described above. Since no pressure is applied to the lay-up during cure, there is no need for heavy or expensive molds in the hand lay-up method. Molds are made of wood, plaster, or reinforced plastic. The low cost of these molds and the use of a single one makes the method particularly adaptable to prototype work; multiple molds can be used to speed production. This method allows workmen to observe at all times the condition of the laminate, such as presence of air, bridging, and other defects, and to correct them immediately.

Boat hulls and other parts produced by the hand lay-up method usually have low glass content. This is especially true when glass mat is the reinforcing material. Generally, liquid resin is used to impregnate the glass, and resin in this state is wet and sticky. Because of this, the maintenance of cleanliness of workmen, equipment, and shop space is a problem.

Unless careful selection is made of the resin, there is a tendency for the resin during cure to become very fluid and to migrate from its original and desired location. The method requires a great deal of hand work and the quality of the production depends more upon the ability and craftsmanship of the workmen than upon any other factor. With extreme care and able technicians, some of the highest quality laminated parts can be produced with this method. Without careful workmanship, however, some of the poorest laminates can be produced.

Several years ago, the Bureau purchased five reinforced plastics landing craft (Fig. 2) for test purposes. These hulls were built by the hand lay-up method over male molds. The boats were produced rapidly and at low cost, and have performed to the Bureau's complete satisfaction.

Bag Method—After the glass has been placed in the mold and wet with resin, the bag method requires that a flexible pressure member be placed over the lay-up. This pressure member is placed so the resin-impregnated glass is compressed tightly between the pressure member and the female mold. This pressure may be applied in any one of several ways. For instance, a bladder can be inflated in a closed mold (Fig. 3), or a vacuum can be applied between a rubber blanket and the mold (Fig. 6), or the mold and lay-up could be pressurized by placing it in an autoclave.

After the bag is in place and the pressure has been applied, the resin-glass lay-up is ready for cure.

The molds needed where a pres-

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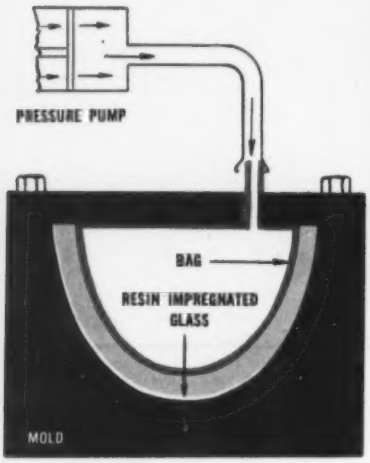
After graduation from Kansas State College in 1938 with a degree in Electrical Engineering, Mr. Alfers spent four years in the Rural Electrification Administration before joining the Bureau of Ships in 1942. He is now in charge of the Plastics and Dielectrics Branch of the Materials Development Div. of the Bureau of Ships, Department of the Navy. Mr. Alfers is a Deputy Navy Member of the Research and Development Boards' Committee on Materials; Project Officer for Electrical Insulating Materials of the Naval Tripartite Standardization Group between the United States of America, Great Britain, and Canada; and President of the Association of Senior Engineers of the Bureau of Ships. Recently Mr. Alfers was presented with the Distinguished Civilian Service Award by the Secretary of the Navy.

Fig. 3 (below)—Bag method of producing plastic boat hulls. The mold is closed by a top member and pressure is applied to the impregnated glass reinforcement by a bladder which is inflated by a pressure pump



Official U. S. Navy photo

Fig. 4—Bag method of applying pressure to glass-resin lay-up was employed in producing this 28-ft. hull. Possibilities of deep framing and other complexities are apparent

sure bladder is used must be rather substantially built. Where a vacuum or an autoclave is used, the molds can be lighter and cheaper, and constructed of materials similar to those which are used for the hand lay-up method.

Since pressure is applied to the resin-glass lay-up, relatively high glass content is possible and, therefore, good specific strengths.

The glass lay-up usually is impregnated with liquid resin, either after the glass is in place in the mold, or just before the glass is placed in the mold. This procedure requires the handling of wet and sticky resin-impregnated glass, which has the numerous disadvantages mentioned in the discussion of the hand lay-up method. Here, again, these problems can be overcome through the use of a first quality pre-impregnated material.

The bag method produces inside boat hull surfaces which are not as smooth and pleasing in appearance as the outside, which is formed against the mold. By taking precautions and using careful workmanship, entirely satisfactory surfaces are possible. The glass at the inside corners, such as around frames, must be carefully pressed in place by hand. The use of high pressures assists in the proper placement of the glass and causes the resin to flow. Dimensions of the inside surfaces are difficult to maintain with high accuracy.

The use of flexible internal pressure members enables great freedom in interior design. Such features as undercuts, deep framing, and other complexities can be conveniently employed. Modifications in interior design can be made after tooling is completed without additional tooling cost. Entrapped air is worked out by hand and by the application of pressure.

Several years ago, the Bureau of Ships purchased a number of 28-ft. boats with reinforced plastic hulls produced by the bag method. Figure 4 shows one of these hulls under construction and the illustration in Fig. 5 shows a completed boat in operation.

Two Molds

The injection and the matched die high pressure methods make use of two matching molds. In each, dry glass, pre-formed to the shape of the boat hull, is placed on the male mold in an inverted position.

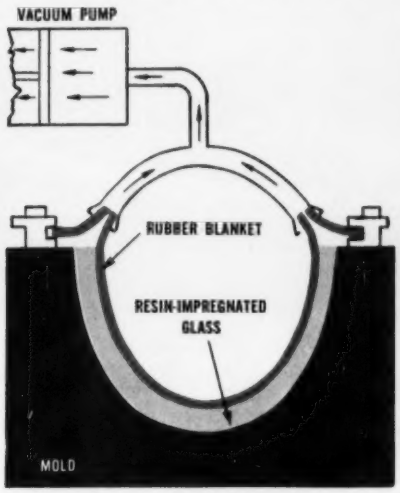
Matched Die High Pressure Method—Since this method has not been used to produce boat hulls, it will be discussed only briefly. It makes use of a matched pair of rigid metal molds, which would operate in a press at about 100 p.s.i. This method has been proposed as a technique for much higher quantity production than is usually obtained from the other methods discussed here. Although this method is being used for producing other reinforced plastic items, the quantity of a particular design of boat hull needed by the services or by the commercial market has never justified the expense of the necessary mold, press, and other equipment. If a small boat were required in quantities of several thousand, this molding technique would probably produce higher quality products, would be more economical, and would be less dependent on skilled manpower than any of the three other methods.

Injection (Marco) Method—This method makes use of matched molds of either rigid or semi-rigid construction. After the dry glass preform is in position on the male mold, the female is placed on the male over the glass. Usually, the glass is slight-

Official U. S. Navy photo

Fig. 5—Completed 28-ft. boat with hull (see also Fig. 3) produced by the bag molding method. Exterior surface of hull is as smooth as the surface of the production mold

Fig. 6 (below)—In rubber blanket molding method, pressure is applied to the lay-up by pulling a vacuum between blanket and resin-impregnated glass. Alternatively, the mold and lay-up could be placed in an autoclave



ly compressed when the female mold is in place. This slight compression insures that the cavity or space between the male and female mold is full of glass under slight pressure, even if the molds do not match with extreme accuracy. By the use of binders on the glass, which are insoluble in the resin, this slight outward pressure of the glass is maintained throughout the molding operation.

After the molds are in place, they are sealed by a moat of resin, as shown in Fig. 7, or by gasketing, as shown in Fig 8. The catalyzed and accelerated resin is injected into the space between the male and female molds around the glass by one of two means: (a) Drawing the resin from the sealing moat or trough by vacuum applied to an opening along the keel line of the female mold (Fig. 7); (b) Drawing the resin into the space from a number of inlets (Fig. 8), or a continuous sealed-in moat or trough at the low point of the molds. This moat or trough is connected to a pot of resin. The resin can be drawn into place by the application of a vacuum at the high point on the mold, assisted by pressurizing the resin pots.

When all the air between the molds has been exhausted by the vacuum and the entire space around the glass has been filled with resin, the resin is ready to be cured. Cure is accomplished either at room temperature or by the application of heat.

Resins with relatively low viscosities are drawn into the mold cavity most readily. The shorter the time required for the injection operation, the greater the production from a set of molds.

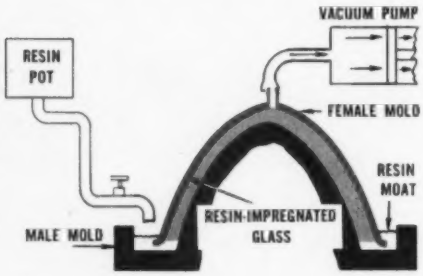
This injection method has been successfully used in Naval shipyards for the production of over two hundred 12-ft. wherries, several 26-ft. whale boats (as illustrated in Figs. 9 and 10), and several 36-ft. landing craft.

Because of the low order of pressures used, the molds can be constructed of materials similar to those discussed for the hand lay-up method. For the injection method, however, the molds must be air tight. The tooling costs, however, are relatively low even though both male and female molds are required. The method is adaptable to prototype work and to production by the use of multiple tooling. All glass is handled dry and resin is piped from drum to the mold cavity, making for a clean operation for workmen, equipment, and shop space.

Mold finish is reproduced on both inside and outside of the boat hull and the dimensions of all surfaces are fixed and reproducible because of the two molds. With molds sufficiently rigid to maintain accurate dimensions of the mold cavity during the molding cycle, more positive control can be maintained over the glass resin ratio. Since the air is removed from the glass lay-up by the vacuum and replaced with resin, the chances of having entrapped air are minimized.

It is a general tendency to make use of glass mat in combination with glass cloth to facilitate resin flow during injection. This results in lowered glass content. With accurate spacing between the two molds, however, all-glass-cloth lay-ups can be used, resulting in high glass content. If the molds are not made properly and there are large inaccuracies in the spacing between the mating molds, dry spots may result where the glass lay-up is too tight for proper resin impregnation. Likewise, resin-rich areas may result where the spacing between the molds is

Fig. 7—In moat method of impregnating dry glass lay-up, liquid resin is introduced into trough, then drawn into place by applying vacuum



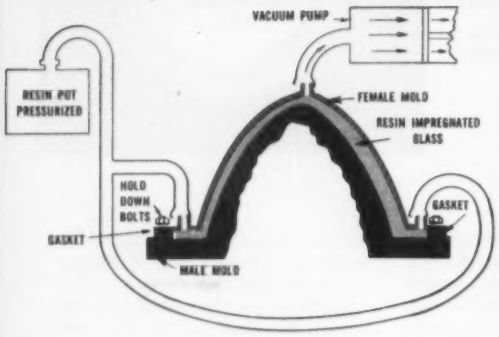


Fig. 8—One hull production method using two molds involves drawing the resin into the dry glass preform from a resin pot

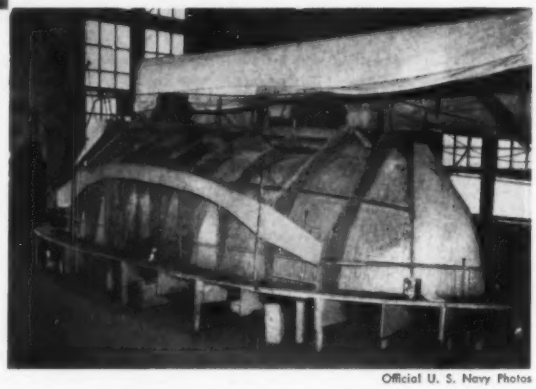


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Fig. 9 (upper left)—Reinforced plastic whale boat. Fig. 10 (above)—Mold set-up in which whale boats were made. Note vacuum connections along keel

greater than the design thickness.

It may be seen that the skill of the workmen is of less importance in the injection method than in the hand lay-up method. Success or failure of the injection method depends more upon the molds and equipment which are used.

Advantages and Disadvantages

As is evident from the above, each of these methods of molding has certain advantages and disadvantages for a particular job. The best method can be determined only by a study of the requirements for that job. For instance, to check the hull lines of a new boat, it is usually cheaper to make use of the hand lay-up method for the initial model. Where accurate control on both inside and outside dimensions is necessary, one of the matched mold methods would be used. It is not believed that any one method can be said to be far superior to all others for any class of work, such as the building of plastic boat hulls.

Reinforced Plastic Quality

Assuming a particular boat hull of a given design and weight, employing a certain type of glass and a certain resin, a very important feature in a boat hull is the quality of the final reinforced plastic. This quality can be determined in service by the boat's resistance to abuse and to deterioration on aging. Without waiting for service experience, the quality must be forecast by such characteristics as proper glass content, uniform resin distribution, freedom from air inclusions, freedom from porosity, good resin-glass bonding, and many others. All of these characteristics are not most readily secured by employing any one production method.

Methods of production are but one feature involved in the complex equation, whose result is a first-quality plastic boat hull produced at a reasonable cost. Other features, such as the proper design, the proper choice of materials, good tooling, and standards and inspection methods are of far greater importance to the success of the plastic boat building industry.

NEWS AND VIEWS OF PLASTICS PROGRESS

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Safety-Goggles, Helmet Parts Molded on Stokes Automatics

A battery of six Stokes fully automatic plastics molding presses, Model 200 D-3, and one Model 741 automatic press are used at Sellstrom Manufacturing Co., Chicago, Ill., to make welding safety-goggles and parts for welding helmets.

Two cup-type goggles are completely molded on the Model 200 D-3 presses; a large welding helmet retainer piece and a larger fit-over goggle are molded on the 741 press. Present manufacturing costs are reported as one-tenth what they were before installation of the Stokes presses.

The safety-goggles and helmets made on Stokes presses constitute part of the more than two hundred eye and face protectors manufactured by Sellstrom, whose products are used in steel mills, coal mines, and chemical laboratories in all corners of the world.

Sellstrom's confidence in the light-weight plastic used in their industrial safety products is evidenced by the definite guarantee of complete satisfaction offered all users, promising long product life and satisfactory use under all kinds of hazardous conditions.

Safety goggles molded on Stokes Model 200 D-3 plastics molding presses at Sellstrom Manufacturing Company plant.

It's Easy for You to Test Vacuum Metallizing

Many people want to know if vacuum metallizing offers a profitable solution to the metal finishing of their products, and they don't want to buy a truck-load of equipment to find out.

The alternative is easy . . . send samples to Stokes for preliminary evaluation and we'll report to you on their adaptability to vacuum metallizing.

Tell us what the part is, what it's made of, what it's used for—assuming these points are not obvious—and how you want it finished.

Then, if vacuum metallizing is practicable for the part you send, we'll return samples, brilliantly metallized, with probable costs per unit, and other factors you will need to know about.

Don't send wood, rubber, cork or leather . . . too much de-gassing needed . . . costs are forbidding. Send samples to Stokes Vacuum Metallizing Department. Meanwhile, if you just wish to be informed about Vacuum Metallizing and what it can do for industry, send for a copy of Stokes' new brochure, "Vacuum Metallizing Today."

STOKES

EDITORIAL

"It's a Cheap Plastic Substitute, Of Course"

Did you ever hear that expression?

If not, you are a man alone.

Similar expressions follow:

(1) "Yes, we have only one yacht now; it's so hard to get good help."
(2) "We're driving this little Ford for the season; we couldn't get the Packard we wanted."
(3) "This is just American lace trimming, you know; I couldn't find any real Val."
(4) "We're using Broadloom in this room. Orientals are sort of common, don't you think?"
(5) "We get The News . . . just for the children, of course . . . they love the funnies!"

Malarkey! Horse-feathers! Yokamoshi! You name it. Whatever you call it, it's self-deceit; one of the wickedest forms of deceit known to man. In fact, only man is guilty of it. The birds and the beasts know better.

Any time you hear people deceive themselves you are at liberty to cringe slightly. Any time you hear them say, "It's a cheap plastic substitute," you should come screaming to your feet and tell them that the Plastics Industry is the fastest growing industry in America. That life is better because plastic products are replacing older materials and doing old jobs better and at lower cost. To be sure, there have been some poor plastic products. But also, we've seen stone foundations crumble, and textiles fade, and steel bridges fall down!

We are in favor of organizing a group to be known as the Society for the Prevention of Calling Plastics Cheap . . . the S.P.C.P.C. Sounds fantastic but it's not. Some years ago a group of travelling men got together and organized the S.P.C.P.C.P.G.; the Society for the Prevention of Calling Pullman Car Porters George.

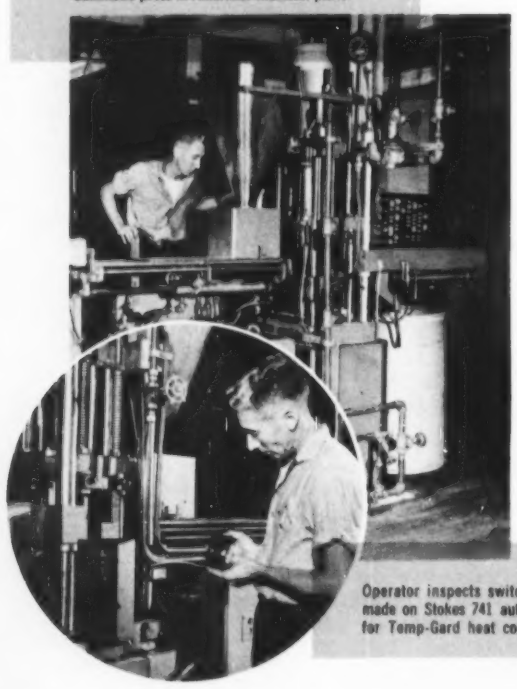
Everyone knows what happened! In every Pullman Car on the continent a little sign says "Your Porter's name is Elmer Frobisher," or whatever it is. So now you call him Elmer!

As Coventry Patmore said, "The truth is great, and shall prevail."

Plastics Excelsior!

American Insulator One of Many Custom Molders Now Using Fully Automatic Molding

Operator makes hourly check on Stokes automatic press in American Insulator plant.

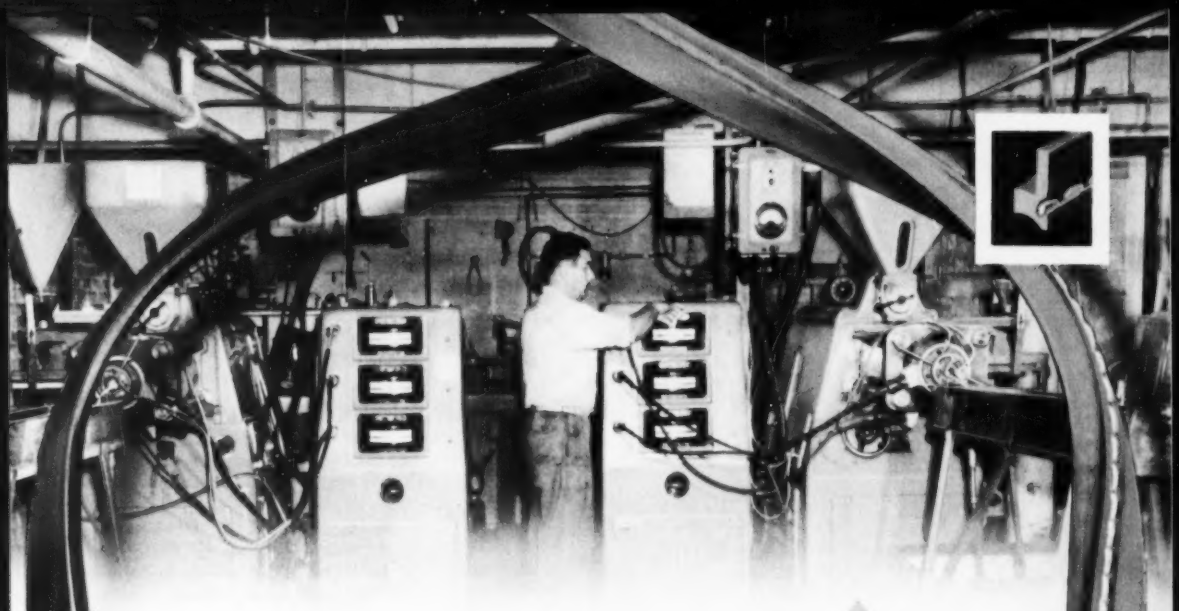


Operator inspects switch-body part made on Stokes 741 automatic press for Temp-Gard heat control switch.

American Insulator Corporation, New Freedom, Pa., is a leading manufacturer in supplying parts of many plastic materials for the electrical, radio and television industries. Company executives use the phrase "completely satisfactory service" to describe the operation of their 50-ton Stokes Model 741 press. This press is used to make plastic elements of the Temp-Gard temperature control switch for electric water-heaters. The Temp-Gard element is one of several parts run on this press. Since labor cost is negligible on fully automatic presses, the user can run the number of cavities which strikes the best balance between mold cost and labor cost. In this case a 4-cavity mold is run on a 3-minute cycle.

Temp-Gard is made by the Kitson Division of the Welsbach Corporation, Philadelphia. Welsbach, once a name to make light of (that's a pun, friends, for the old-timers who remember Welsbach Mantles!) now denotes a great corporation serving industry and municipalities as a utility and engineering service.

Plastic elements of the Temp-Gard temperature control switch for electric water-heaters made on a Stokes press at American Insulator Corporation.



Compounding, Coloring and Extruding of Elastomeric Vinyls at a Single Pass!

Simplicity, economy and quality are conspicuous in the Stokes-Windsor operation at The Lawrence Process Company, Inc., Lawrence, Mass. Each of two Stokes-Windsor Model RC-100 twin-screw extruders is producing plastic shoe-welting at the rate of 125 pounds or more per hour within tolerances of ±.002".

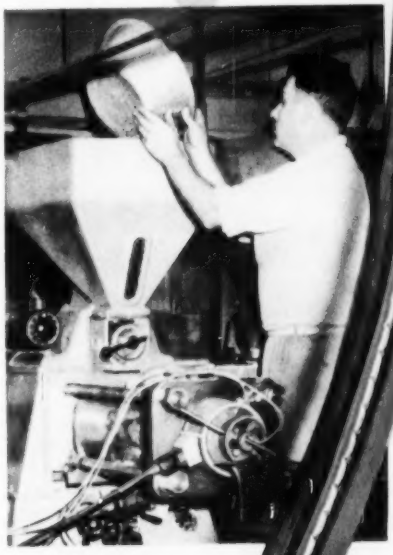
"Our Stokes-Windsor extruders have so completely justified our expectations that they seem almost as if they were custom-tailored to our particular needs," states E. F. Hogan, president of Lawrence Process. "We find the twin-screw extruder gives us a remarkable degree of dimensional stability."

Compounding, coloring and extruding are all done in a single pass at Lawrence Process. Pre-blended plasticized PVC or elastomeric vinyl is used; modest in-plant pre-blending equipment saves the firm from 4 to 6 cents a pound in the preparation of the material. No Banburys or other large-size equipment are required. And only three men do all this work on two machines!

Use of Stokes-Windsor twin-screw extruders has helped Lawrence Process to streamline its production. All inspection, gauging, reeling, and packing of the finished product is done at the wind-up end of each extruder. The firm plans to double its present extruding capacity within the next few months.

Head-on view of the two Stokes-Windsor extruders at Lawrence Process Co. Each extruder produces plastic shoe-welting at the rate of 125 pounds per hour, 25% above nominal capacity.

Close-up view of one of the Model RC-100 Stokes-Windsor extruders at The Lawrence Process Company. Operator is shown pouring pre-blended plasticized PVC into the hopper.



Plastic shoe-welting made on a Stokes-Windsor extruder at The Lawrence Process Co.; note the variety of design.

STOKES

Some of the parts made on the Stokes presses at Stromberg-Carlson. Note the fine precision detail on many of them.

Close-up of a Stokes semi-automatic plastics molding press at Stromberg-Carlson. Operator is lifting out two jack face strip pieces for use in switchboard installation.

Stromberg-Carlson's Nine Stokes Semi-Automatic Presses Make Wide Variety of Molded Parts

At their Rochester, N. Y., plant Stromberg-Carlson makes many different products for both the communications and appliance fields . . . makes most of the component parts, too! Products include telephones, switchboards, radios, television sets, and sound equipment . . . many containing molded plastic parts.

Four 150-ton and five 50-ton Stokes semi-automatic compression and transfer molding presses make such items as TV picture tube supports, telephone earcaps and handsets, switchboard 20-point and jack face strips, and XY-dial switch 36-point plugs. Some of the parts have an extremely critical tolerance; others, such as TV tube supports, can vary as much as $\pm 1/16$". One of the parts, a wire bank separator, requires extremely close tolerances; an accumulative variation of more than .004" on a total length of 1.260" would result in a wrong-number connection!

Easily adapted to fit a wide variety of molding requirements, the Stokes presses at Stromberg-Carlson permit rapid set-up and frequent change of mold without interrupting the general flow of production. All types of phenolic molding materials are used, including general purpose, rubber-modified phenolic, impact (flock or rag filler), heat-resistant (asbestos filler), and electrical (mica filler). In addition to the parts illustrated, about 70 other plastic molded parts are made on Stokes presses for use in telephones, television sets, and sound equipment.

Battery of Stokes semi-automatic plastics molding presses at Stromberg-Carlson. Women operators check such parts as coil spools for telephone ringers and wire bank separators before distribution to the proper assembly division of the company.

Theodore G. Debreceni

Stokes Opens New Cincinnati Office

Effective September 1, Stokes representation in Cincinnati, formerly in the competent hands of Williams Sales Company, will be handled by Stokes' own organization. The change is part of a program of extending The F. J. Stokes Machine Company's direct organization to all major industrial areas of the country.

The Cincinnati office, which will be under the supervision of M. S. Adler, Stokes' Cleveland manager, will service southern Ohio, southern Indiana, all of Kentucky, and West Virginia except the Panhandle. The new Cincinnati office is located at 2904 Woodburn Avenue.

In immediate charge of the new territory will be Theodore G. Debreceni. Ted joined the Stokes organization in June 1950 after previous experience in the metals field. He was shortly called back to the Navy as an ensign and saw service with the hydrographic department in the Mediterranean, Caribbean and Greenland. He was graduated from Case Institute of Technology with degrees of B.S. and E.A.

STOKES

F. J. STOKES MACHINE COMPANY
5534 TABOR ROAD, PHILADELPHIA 20, PA.

STOKES MAKES Plastics Molding Presses / Industrial Tabletting and Powder Metal Presses / Pharmaceutical Equipment / Vacuum Equipment / High Vacuum Pumps and Gages / Special Machinery

PRINTED IN U. S. A.

Servel Goes 'All-Plastic'

New Wonderbar "refrigerette" uses 30 lb. of plastics, is designed to make refrigeration available in any room of the home, in offices . . . wherever a compact, efficient refrigerator is wanted

MARKING the nearest approach to an all-plastic refrigerator yet developed, a new furniture-styled "refrigerette" with many unusual features has just been placed on the market by Servel, Inc., and already has received enthusiastic market acceptance. The new electric-powered unit, designed to make refrigeration available in a number of locations for which conventional refrigerators are unsuitable, provides approximately 2 cu. ft. of storage space for food, drinks, or drug products which must be kept cold.

Servel's new Wonderbar, as it is called, with its handsome furniture styling, was specifically designed to fit anywhere in the house or, for that matter, in business and doctor's offices, laboratories, and other locations where a small, efficient refrigerator is needed. Optionally available metal legs and rubber-tired casters enable it to be shifted quickly from room to room.

Behind the development of this revolutionary new-type appliance, which depends so heavily upon plastics for effective design and operation, lies Servel's conviction that the regular household refrigerator is no longer able to keep pace with the demands of modern living in many households, and that a real need exists for a second, small refrigerator installed right at the point of use. "We are convinced," states W. Paul Jones, Servel president, "that refrigeration has changed from being associated exclusively with the kitchen to becoming part of every room in the house."

Phenolic Cabinet

The total weight of the Wonderbar is around 80 pounds. Of this amount, approximately 30 lb. consists of molded plastics. In basic construction, this new-type appliance consists of a molded phenolic outer cabinet with complete inner shell and door liner injection molded of styrene copolymer. Slabs of Styrofoam are used in conjunction with fibrous glass to insulate the walls. The unit includes nine major plastic components, in addition to polyethylene ice cube tray grids and a nylon latch roller.

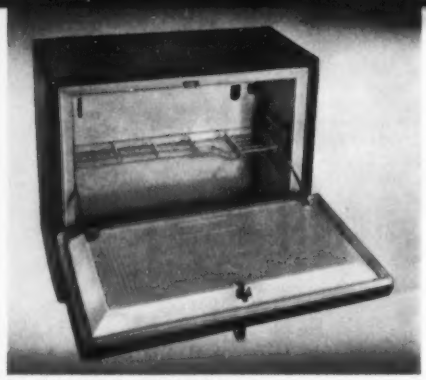
Production of the Wonderbar culminates an extensive design and development program carried out under the direction of Donald Dailey, Servel product manager, who tells in an accompanying box why plastics were selected for its construction. In the development of the de-

Color plates courtesy Servel, Inc.

Designed as smart furniture and with a variety of indoor or outdoor uses, portable refrigerette uses plastic components to advantage; operates on AC or DC, 32 to 230 volts

PLASTICS IN THE WONDERBAR

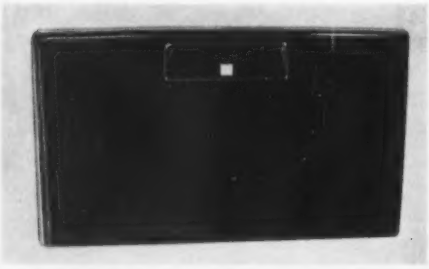
MATERIAL	USE
PHENOLIC	Cabinet Outer Door Control Knob
STYRENE AND STYRENE COPOLYMER	Inner Liner Liner Front Liner Baffle Inner Door Panel Chill Tray Name Plate
POLYETHYLENE NYLON	Tray Grids Latch Roller

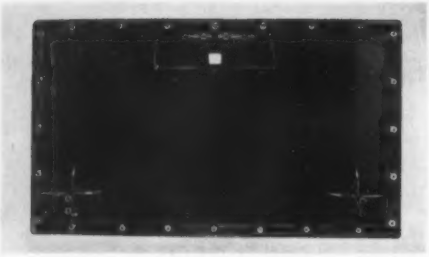


Photos this page courtesy Plastics Div., General American Transportation Corp.

Smooth stain-resistant molded phenolic outer cabinet of portable refrigerette is available in three different finishes

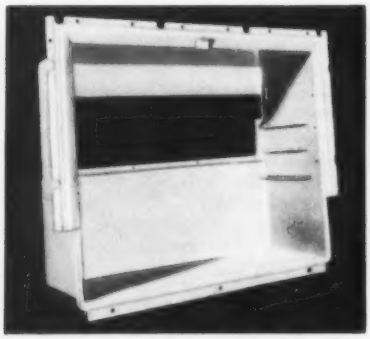
Drop-down phenolic door provides easy access to spacious interior, styrene tray; opened door doubles as a shelf



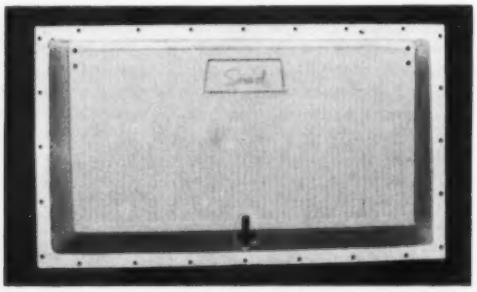


Phenolic outer cabinet has 13 ribs cored on the punch side for attaching metal back

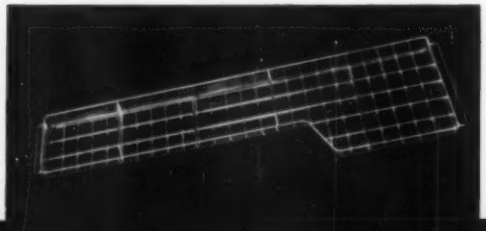
Front of phenolic door (top) has inset for name-plate; rear (bottom) has cored openings for attaching copolymer liner



Styrene inner liner has ribbed bottom, integral ledges, cores for attachment to outer cabinet



Copolymer inner door liner is cored for assembly to outer door shell; ribbed surface guards against marring, is easy to clean



Tray, molded of transparent styrene, can be inverted to double as a chill shelf or defrost pan

WHY PLASTICS WERE SELECTED FOR THE SERVEL ELECTRIC WONDERBAR

by DONALD DAILEY†

Plastics were selected for the outer shell, liner, and other parts of the Servel Electric Wonderbar because plastics fitted in more closely with the over-all design of the "refrigerette" than did metal.

In designing this new appliance we sought to create a new market for refrigeration. We set out to make a completely different refrigerator—one that would fit in the office, living room or bedroom—in fact, everywhere that the conventional kitchen refrigerator doesn't fit. To accomplish this purpose meant that we had to obtain a furniture look and character in the Wonderbar.

One obvious solution would have been steel with a good grain finish. However, we felt that we could do a better job with plastics, get a quality appearance with integral grain, insure better resistance to stains, abrasion, etc., and at the same time obtain a better solution to the thermal and cabinet seal problems that usually besiege all refrigerator manufacturers.

By designing the one-piece styrene combination liner and breaker so that it would closely fit the one-piece phenolic shell, we were able to obtain a virtual two-piece assembly that could be properly sealed. The result was far superior in thermal characteristics.

Any development as radical as this one is naturally full of hazards. We know from long experience with various plastic parts that they can be either a headache or a boon, depending upon intelligent application, good tool design, proper selection of materials, and the experience and cooperation of the molder. Many problems were encountered in developing the Electric Wonderbar, but they have been met and mastered.

The results have been most gratifying, not only in customer approval and sales success, but also in what our engineering and production people have learned about plastics for future application.

† Product Manager, Servel, Inc.

sign, Servel worked closely with engineers of the plastics division of General American Transportation Corp., Chicago, Ill., which molds all the plastics components. Assembly operations are carried out by Servel at its plant in Evansville, Ind.

The Wonderbar comes in three finishes—mahogany mottle, blonde, and white—or is available in decorator colors on special order. The phenolic cabinets are molded in either mahogany or black, the latter being finished with baked enamel for the colored models.

Stain-Resistant Throughout

The plastic cabinet, which resists stains, alcohol, and scratches, is designed with a full-width drop-down door which provides easy access to the interior and serves as a shelf when opened. The smooth, stain-resistant molded plastic interior, easily kept clean, accommodates two full-sized ice cube trays on a metal shelf across the top and stores a plentiful supply of appetizers, soft drink bottles, quart size bottles, and even siphon bottles. The handy chill shelf, adjustable to three different levels, doubles as a defrost receptacle when inverted. Operation of the noiseless electrical refrigeration mechanism, operating on the absorption principle, is regulated by means of a convenient control knob.

A breakdown of the molded plastic components of the Wonderbar shows over 22 lb. of phenolic material and nearly 7 lb. of styrene and styrene copolymer—mostly the latter. Phenolic parts include the main outer cabinet, or housing, the matching door cover, and temperature control knob. The styrene components comprise the inner liner, liner front, liner baffle, inner door panel, combination chill tray-defrost shelf, and name plate.

The largest and heaviest plastic component of the Wonderbar is the outer cabinet, whose maximum exterior dimensions are 25⅛ in. wide by 23¼ in. high by 18⅞ in. deep. This is molded of Bakelite BM-780 phenolic material in mahogany mottle and black. Two coats of baked enamel are used to finish the black cabinets in blonde, white, and special colors. The cabinet weighs 17 lb. 1 oz., or about the same as a table model television cabinet for 19-in. screen. Average wall section of this large molding is 0.190 inch.

Cold Air Kept In

Since the cabinet must support the weight of the inner shell, refrigeration mechanism, bottle goods, and other contents, as well as serve as a foundation for the metal legs which bear the entire weight of the appliance, it must be extremely sturdy and must provide attachment for various other components. Mounted directly to the cabinet during the assembly process are the complete copolymer inner shell, the door, which has a phenolic exterior surface, a copolymer inner panel, and the sheet metal back, which encloses the mechanism between itself and the back of the inner liner. The cabinet is so designed that the lower section of the front—a section about 6 in. deep—is integrally molded with the rest of the housing. The door, hinged at the bottom, forms the rest of the front. This construction gives the unit a "well" at the bottom, thus preventing cold air from spilling out at this point each time the door is opened.

Thirteen heavy internal ribs, extending from the front to the back of the cabinet, are cored on the punch side for attachment of the

(*Continued on p. 207*)

Aboard ships, plastic refrigerette is a handy, practical, and efficient unit

Courtesy Servel, Inc.

POWER PACKS FOR FLASH

PORTABLE electronic flash equipment is rapidly opening up a new horizon in the photographic field. Utilizing a special type of photo tube which, unlike regular flash bulbs, does not have to be discarded after each exposure, this equipment enables the photographer to "freeze" even the fastest action. Power packs for these high speed exposures consist of special type dry cells or rechargeable wet batteries housed in compact carrying cases.

At the recent annual exhibition of the Photographers' Association of America, electronic flash equipment was displayed which makes use of formed copolymer sheet material for battery pack housings and related components.

Both Amglo Corp., Chicago, Ill., and Strobo Research, Milwaukee, Wis., have adopted these tough, easily fabricated materials to give equipment greater ruggedness, lighter weight, and other qualities difficult to obtain in the sheet metal housings which have been widely used in the past. Such equipment must be able to withstand day in, day out usage under a variety of conditions. On emergency assignments, the press photographer may have to toss his camera and other paraphernalia hurriedly into the car, but he must be sure that they will function properly when he trips the shutter.

Protection, Light Weight

Protection against damage in the event of accidental bumps and drops is an important factor in equipment of this type. Also, power pack housings must also be as light as possible and should resist scratching and abrasion. Because of the high voltages involved, electrical insulating properties are also desirable.

These are among the points which led Amglo Corp. to adopt formed Boltaron cases for several of its latest model Speedlight outfits, which are just being introduced to the market. Functionally designed by Palma-Knapp Associates, Chicago, the cases are produced by Arrem Plastics, Chicago, using tan Boltaron sheet material having a "maze" finish resembling the hammerloid finish applied to metal.

Courtesy Amglo Corp.

Stylish case for housing camera's portable batteries is fabricated from copolymer sheet; case is lightweight, scuffproof, and comfortable to carry

A. F. Henninger, president of Amglo, points out that the new cases, which are curved to fit the body, permit scientific weight distrubtion and are carried with greater ease and comfort than the previous straight-sided metal cases. They provide an almost perfect match for the carrying strap and other leather accessories widely used by photographers, and due to their tough, scuff resistant properties will retain their original appearance for years.

Unlike sheet metal cases, Amglo's new plastic housings will not dent or "ding" if accidentally dropped; nor are they likely to damage furniture or other objects with which they may come into contact. Since a large amount of electrical energy is generated within the power pack, Mr. Henninger states that the insulating properties of the plastic material make it preferable, from a safety

Courtesy Strobo Research

Vacuum formed sheet is used in flash unit to house power pack and as a cover for the lamp; wide carrying strap is extruded vinyl

PHOTOGRAPHY

Formed plastic sheet material replaces metal for battery and lamp housings, opens new markets because of its proved advantages

standpoint, to the conductive metal previously employed.

Forming Dies

Parts for the Amglo power pack housings are formed basically by a plug and ring technique. Cast aluminum dies are used on the components for the largest case, and cast phenolic dies for the two smaller units. The cases consist of four parts, including the two halves, the removable cover, and a section in the back permitting access to the batteries. The halves are solvent cemented together with a butt joint which is further reinforced by a stainless steel molding which covers the seam and provides decorative trim. Additional strength is gained from the padded feet of the case, which are anchored through the bottom directly into the metal chassis, and from the formed cover, which fits tightly over a shoulder on the case's lower section. The metal carrying handle also fastens to inner chassis.

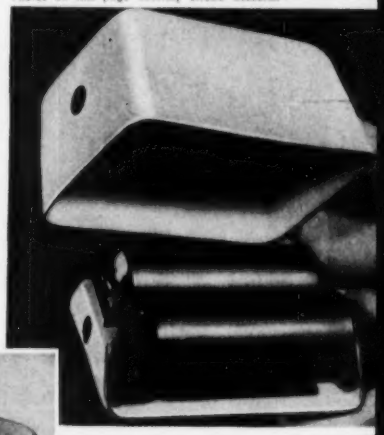
Formed plastic components used by Strobo Research in its latest type Stroboflash II portable units are fabricated of Royalite sheet material by B. J. Plastics, Milwaukee. Edward R. Farber, president of Strobo Research, says that this material "fulfilled almost every one of the requirements for an ideal packaging material for our new Stroboflash." Among the specific points cited by Mr. Farber are the following:

The material lends itself to relatively complicated shapes and deep draws with very simple, inexpensive dies and is ideal for short runs required for limited production. It has high electrical insulating value, is easily punched and drilled, and possesses a scuff-resistant finish which precludes the need for extreme care in handling, manufacture, and shipping. Its warmth to the touch makes it ideally suited for carrying close to the body, while the integral finish obviates supplementary finishing

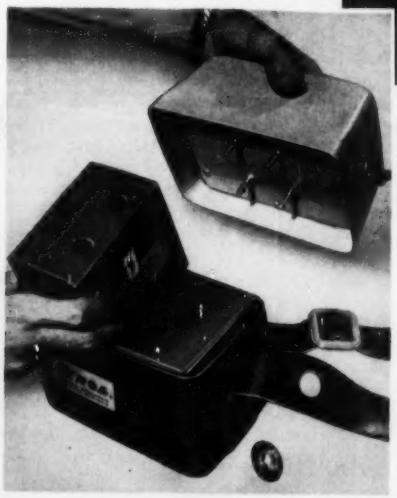
(*Continued on p.* 204)

Water resistance of copolymer sheet permits pack and lamp to be used in the rain

Photos on this page courtesy Strobo Research



All electrical components are mounted on vacuum formed chassis, housed in the grey-colored upper half of the power pack



Lower section of electrical component case houses two 225-volt batteries; upper contact prongs insert in batteries when case closes

Two-piece plastic case, housing the flash unit's power pack, is opened by unscrewing the special fasteners that secure both sections

Getting the Best from Plastisols

Solution viscosity, speed and temperature of fusion and curing, and mold surface preparation all contribute to the success of slush molding operations

One-piece woman's rain boot, with reinforced heel and toe, is slush molded on continuous operation production line

Lightweight, transparent rain cover, slush molded of vinyl plastisol, is designed for caps of naval officers

SOME interesting advances are being made in slush molding plastisols, both in materials and in processing methods. Plastisols—basically mixtures of vinyl resins with plasticizers and sometimes with thinners—seem on the surface to offer a simple and easy path to the production of thin or thick films, either flat or molded into the shape of a finished product. However, as one plastisol processor puts it: "Plastisols are like women. You have to learn to know them in order to get along with them. You have to study their moods and be ready and able to change your approach as these moods change."

It thus becomes necessary for the successful plastisol processor to pay careful attention to such variables as solution viscosity, entrapped air bubbles, fusion and curing temperatures, and speed of travel through ovens. Add such factors as fluctuating ambient temperatures and changing humidity, and the design of a plastisol molding set-up becomes much less simple than at first blush.

Attention to Detail

Some of the work currently being done at the plant of Classic Plastics, Inc., New Hyde Park, N.Y., points up the way in which these problems can be solved by careful attention to detail. In this plant is set up a highly flexible production line which was specifically designed by the company engineers for slush molding of plastisols. This production line, roughly oval in shape, brings the molds back to the starting point with a minimum of manual handling. Throughout the line are controls whereby the speed of the various conveyors and the heats of the various sections of the ovens can be accurately controlled. In addition, the ovens are equipped with baffles which can be adjusted so that either large or small items can be economically fused and cured. Gas-heated air is employed and a recirculating unit furthers economy.

Electronic controls govern the speed of the conveyor lines and the heat in the ovens, factors which must be varied according to the thickness of material being cured, the temperature of the surrounding air, and the humidity. These electronic controls, once set manually, maintain speeds and temperatures within close limits.

One of the interesting production items being made at Classic Plastics is a slush molded rain boot. This boot, produced in a single piece and in a continuous operation, has the appearance of a unit molded in different sections and then assembled, yet its one-piece construction makes for speed and economy of production and for a long wearing, well reinforced unit. The upper part of the boot is a quite thin section, can be made almost transparent, while the sole is much thicker and can be made opaque. The toes and heels are reinforced by varying sections, starting thick at the sole and tapering off to the thickness of the leg section.

Mold Charging

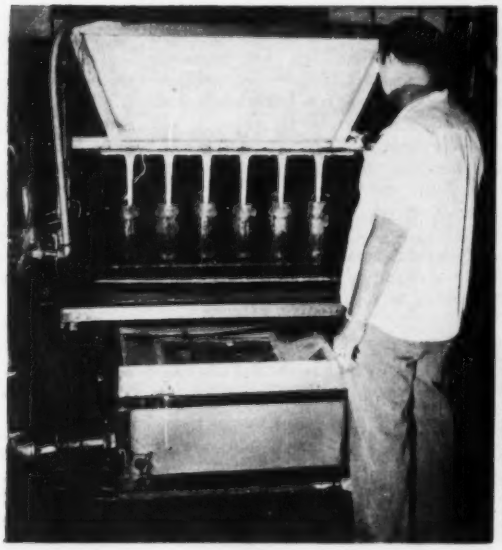
At the beginning of the production line for the manufacture of these rain boots, the open cold metal molds are placed on a rail directly under a tank containing the plastisol compound, the flow of which into the open molds can be controlled by the operator. The molds are charged by careful metering; the thickness of the ultimate wall section is determined largely by the viscosity of the plastisol compound. It is stated by Classic engineers that the control of viscosity at this point is of utmost importance. They use a mixture of two different plastisols blended with a thinning ingredient which permits them to obtain a low viscosity for thin film forming with-

out the use of undesirably large amounts of plasticizers. Through the use of pre-tested controls and carefully compounded material it is possible to reduce film sections—when desired—to extreme thinness.

After the molds are filled, they are picked up by a conveyor line and the excess material is immediately dumped into a collecting trough, into which the molds continue to drain until they reach a point where they are re-inverted and manually transferred to another conveyor where they start travelling through the first or fusing section of the oven.

The liquid plastisol material dumped and drained from the molds flows down the collecting trough to a sump from which it is pumped back to the feed tank. At intervals, when observation shows it to be necessary, the liquid plastisol is pumped into a de-aerator where, under 30 in. of vacuum, all entrapped air is removed. It is necessary that this be done because entrapped air will cause bubbles in the finished product and, obviously, a certain amount of air will continually be trapped during the filling and dumping operations.

After the drained molds are reinverted, the thick sole section of the boot is built up by the flow of a certain amount of the plastisol to the bottom of the mold before fusing sets up the compound. Reinforcement points at toes and heels are obtained by the use of a specially designed up-and-down conveyor. This unit, while the rail holding the molds is in motion, tilts it upward and then reverses it while the plas-

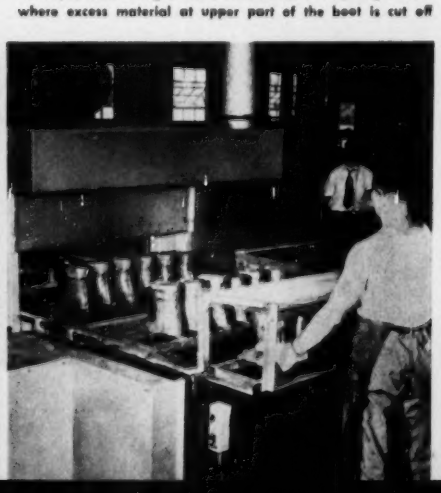


Operator begins first step in the production of slush molded rain boots by controlling flow of the plastisol compound into the cold metal molds

Metal molds are carried by conveyor from filling station and then inverted to enable excess material to pour out into a collecting trough

Baking temperature of the curing oven into which the molds next pass and the speed of the conveyor line are accurately controlled by an electronic system

Conveyor from curing ovens carries molds to trimming station where excess material at upper part of the boot is cut off



tisol is still in a state of liquid flow.

Fusing temperature as used in the ovens at Classic Plastics, is 350° F.; curing, at a later stage on the conveyor line, takes place at 400° F.

At the end of the curing oven conveyor, the molds stop for a moment at a trimming station. Here the excess material at the upper end of the boot is cut off so that when the boot is finally removed from the mold it is a finished item, ready to have straps or other fastening devices attached.

After trimming, the molds pass along another conveyor line through a curing tank where a fine "fog" of cold water brings the molds down to room temperature. The molded boots are then manually removed from the molds, which are delivered to the filling end of the production line, ready to start the cycle again.

Transparency of Film

When using a clear plastisol material, the transparency or opacity of the cast film is a function of the mold surface against which it is formed. A rough mold surface produces an opaque film; the smoother the mold surface, the more transparent the film. Thus, in the rain boot with a transparent top and an opaque sole, the part of the mold which forms the sole is left rough while the part which forms the upper is given a smooth, fine finish.

There are several ways in which smooth mold surfaces can be obtained to produce transparent film sections by slush molding. The metal mold can be highly polished; the polished surface can be made still smoother by plating; or the molding surface can be coated with a high temperature baking lacquer.

In the molds for the rain boots already described, the lacquering method has been adopted as satisfactory and economical. The bottom part of the mold which produces the sole of the boot is masked off. The lacquer is applied only to the sides of the mold. After baking the lacquer, the mask is removed; thus the mold is left with a relatively rough metal surface for molding the opaque sole of the boot and a smooth lacquer surface to produce the transparent upper.

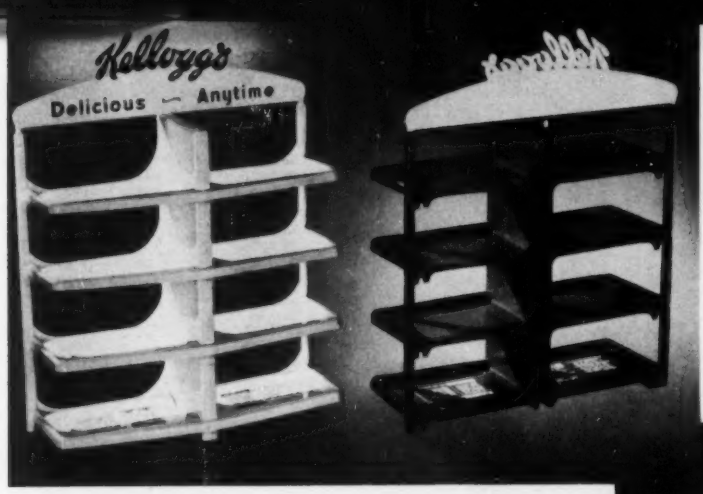
Another job under development on the slush-molding production line at Classic Plastics is a rain cover for officers' caps, which is being considered at the moment by the U. S. Navy. Other materials have been used for such covers, but with indifferent results. It was desired to produce a cover which would fit snugly over the cap, regardless of size, would be neat in appearance, would be transparent and light in weight. When this project was first started, it was possible to produce cap covers with a weight of 3½ oz. each. Last report has it that this weight has been reduced to 1 oz. without sacrifice of rain proofness or transparency. Because of the elasticity of the hat covering, 3 or 4 sizes of covers will accommodate all sizes of regulation caps.

This project opens up possibilities for hat coverings for policemen, doormen, railroad men, or similar civilian applications.

Other work with plastisols being done at Classic Plastics includes heads, hands, and feet for full size mannikins; rollers for applying paint; application by dipping of protective coatings to metal refrigerator parts; and the production of extremely thick dip-molded insulation on marine radio equipment.

On another conveyor line, the molds are then passed through a fine spray of cold water that brings the molds down to room temperatures

Operator manually removes finished boot from the mold; empty molds return to beginning of production line to start the cycle over again



Identically molded styrene shelves, available in either red or white, are easily assembled to form attractive display unit

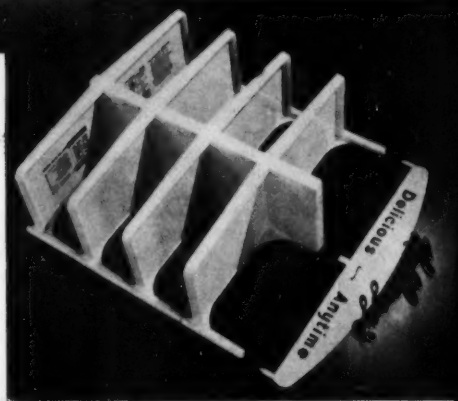
Cereals on Display

IDENTICAL styrene shelves produced from a single mold, are easily assembled to form an attractive 2-shelf or 4-shelf package display unit. The racks are used in the completed dispenser together with a decorative styrene sign silk screened with the company's name and ad message to promote the cereal products of the Kellogg Co., Battle Creek, Mich. Molding is by Prolon Plastics, Div. Pro-phy-lac-tic Brush Co., Florence, Mass.

Each of the shelves is molded with a center partition running at right angles to the base and two integral hollow supports with tapering diameters located at each of the rear end corners of the base. In assembling the display unit, the top surface of the center partition is cemented to the bottom of the shelf above it. At the same time, the end tubes of the shelf which serves as the upper section are fitted into their hollow counterparts on the lower shelf. Metal rods are then inserted almost the full length of the tubes and secured with Parker-Kalon self-tapping screws.

Final step in the assembly is fitting the molded-in lugs of the styrene sign into the upper ends of the supporting tubes.

The shelves are run in a single-cavity mold on a 22-oz. Reed-Prentice machine; the sign is run in a single-cavity mold in a 16-oz. Hester machine.



Molded-in lugs of cereal sign are securely fitted into the upper ends of display shelf's supporting tubes

Assembled plastics unit offers decorative and practical display for the miniature cereal packages

Operator removes molded shelf from a 22-oz. Reed-Prentice machine. All the shelves are run in a single-cavity mold. Tubes and center partition are molded in

Towels, dish cloths, or wiping rags are neatly and firmly held in place in an attractive polyethylene holder, which adheres by a special adhesive to any smooth surface. Flexible triangular flaps in each of the four circular openings of the unit fold back to receive the towels, then close in on the material to secure it in position. The Drayp Towel Bar is produced by the A. J. Ganz Co., 7457 Melrose Ave., Hollywood 46, Calif.

Molded of Vinylite elastomeric plastic, a flexible frame is used to protect and improve the appearance of auto license plates. The frame, which requires no tools for installation, is simply stretched slightly to mount it on the plate. It will not rust or dent, will resist moisture, oils, and greases, and can easily be wiped clean. The frame is by John Carlson & Sons, Inc., 12 Cass St., Springfield, Mass.

PLASTICS PRODUCTS

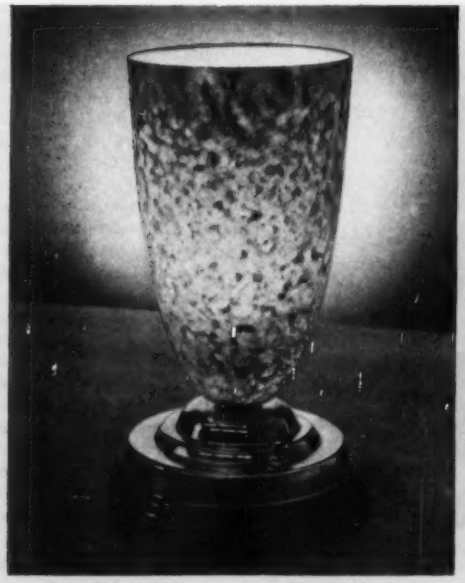
A nozzle for garden hose, designed to give long service without leaking, is molded of green transparent Tenite II cellulose acetate butyrate. The durable, corrosion-resistant, lightweight nozzle has a black "O" ring set into the inner barrel to prevent backward seepage of water. The outer barrel turns to control the water flow. Manufacturer of the unit is Vichek Tool Co., 3001 East 87 St., Cleveland 11, Ohio

A 6 in. adhesive dispenser, with its barrel and the end button molded of cellulose acetate butyrate, is as easy and as convenient to use as a pencil. By pressing the point of the "Glu-Pen" against any surface a dot of glue is immediately ejected from a replaceable glue cartridge located within the barrel. The unit is made by Glu-Pen Corp., 11 West 42 St., New York 36, N. Y.

A double-duty defroster tray that also serves as a handy meat preserver is molded of clear polystyrene. The lightweight, shatterproof unit, 14½ in. long, 10¾ in. wide, and 2 in. deep, fits under the ice-cube freezing section of the standard refrigerator. Its ribbed bottom permits freezing air to circulate around the meat. Molded by the Tri-State Plastic Molding Co., Inc., Henderson, Ky.

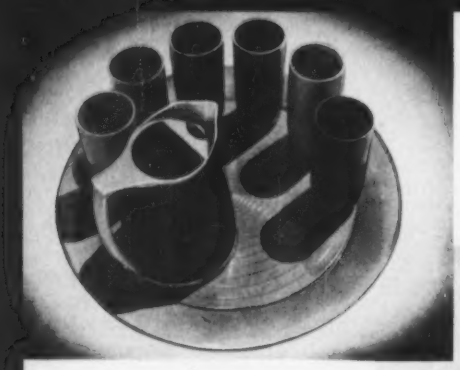
Smooth, high-luster finish of urea plus its resistance to scratching, burning, or chipping are combined to advantage in an attractive toaster base. The base, in decorator's ivory, serves as a protector where there is the most danger of marring the toaster's finish. The unit is for use on products of General Electric Co., Bridgeport 2, Conn.

A soft, mottled light, ideal for the darkened TV room, is effected with a lamp shade molded of heat-resistant melamine-formaldehyde resin and filled with chopped cotton fabric. The lightweight, washable shade is available in four colors. Molded by Nichols Plastic and Engineering Co., 13007 South Main St., Los Angeles, Calif., for Trailite Mfg. Co., 2326 West 246 Pl., Lomita, Calif.



An acetate model convertible, powered by two batteries in an acetate case and capable of being operated by remote control, is a fascinating new toy for children. Movement of the car—both forward and in reverse—is controlled by buttons. A model jeep is also available. By Vibro-Roll Products, Inc., 1621 Penn Ave., Pittsburgh 22, Pa.

PLASTICS *Merchandising**



1

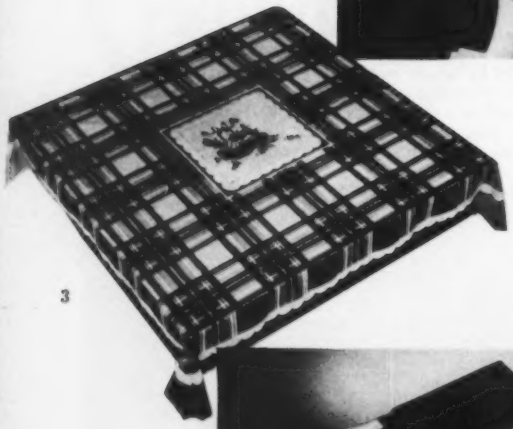
1 Serving tray—Light weight tray, molded of styrene, is a new addition to an informal diningware line that includes tumblers and pitchers. The extra-large 19 in. tray is available in six different colors—coral, chartreuse, blue, grey, green, and burgundy. The tray can easily be wiped clean.

Plas-Tex Corp. 2525 Military Ave., Los Angeles 64, Calif.

2

2 Billfold—Embossed textures of black Morocco, red lizard, or brown alligator grain lend an attractive appeal to a billfold made of Vinylite sheeting. The tough, flexible billfold, with electronically sealed seams, will resist tearing and abrasion, can easily be cleaned, and will not crack or peel. Two hidden compartments for currency are included in the billfold. Also available are similarly styled wallets and key cases.

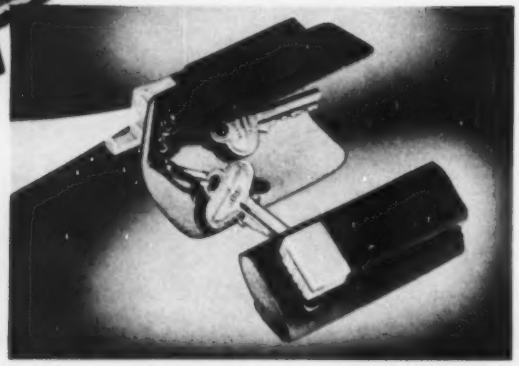
Autopoint Co., 1801 Foster Ave., Chicago 40, Ill.



3

3 Tablecloth—A 6-gage vinyl tablecloth, 54 in. by 54 in., is patterned with a colorful scottish plaid design surrounding a fruit and basket center motif. Each of the cloths is hemmed on all 4 sides and is packaged in a reusable polyethylene wrap. The cloths are priced at $12 per doz. and can be had in three different color combinations.

Hermann & Jacobs Corp., 52 White St., New York 13, N.Y.



4

4 Pocket flashlight—A pocket flashlight, with styrene top and metal battery case, fits snugly into the side pocket of a leather key holder to provide a compact unit for spotlighting keyholes, theatre programs, or the like. A hinged section in the two-part styrene head is easily flipped up or down to act as an automatic light switch. Luminescent powder painted on the head emanates a purple glow in the dark.

Bantam-Lite, Inc., 7 West 22 St., New York 10, N.Y.

* Reg. U.S. Pat. Office

5 **Bath spray**—Maintaining bath water at the proper temperature is simplified by consulting a thermometer built into a Tenite II cellulose acetate butyrate bath spray. The thermometer rests safely inside the neck of the transparent spray beneath a calibrated scale hot-stamped in blue on the surface.

Trimble, Inc., Rochester 13, N. Y.

6 **Sponge holder**—Designed to keep the housewife's hands out of water and strong solutions, a cellulose sponge is fitted with an attractively styled styrene handle. A simple downward pressure on the handle quickly squeezes out the water. The handle is available in red or yellow; the entire unit retails at 39¢.

Federal Tool Corp., 3600 West Pratt Blvd., Chicago 45, Ill.

7 **TV toy**—Rolls of animated cartoon strips, featuring Walt Disney characters, are wound around a motor in this miniature polystyrene TV set. As the motor and the cartoon rolls unwind, four min. of action is provided on the "screen." The set is available in tan with a simulated wood grain finish. Retails for $2.00.

Automatic Toy Co., 77 Alaska St., Staten Island 10, N. Y.

8 **Knife and axe set**—Leather-sheathed knife and axe in a new outdoorsman set are equipped with chip-proof Tenite II cellulose acetate butyrate handles. The corrosion resistant Tenite II is molded in a knurled pattern and palm-fitting shape to assure a firm grip.

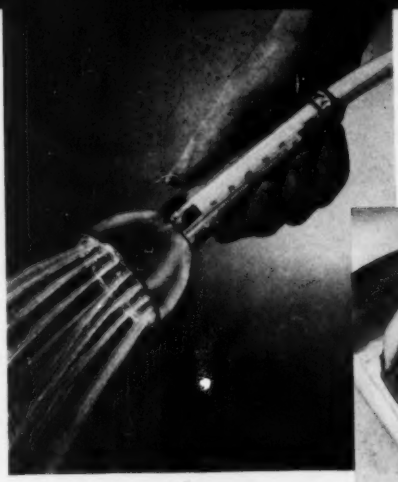
Colonial Knife Co., Inc., Oak & Agnes Sts., Providence 9, R. I.

9 **Space goggles**—Standard equipment for the young interplanetary space traveller are space goggles with red cellulose acetate frames and shining metallized translucent acetate lenses. Included in the set is a metallized styrene space gun.

Rel Plastics, East Paterson, N. J.

10 **Calculators**—Two quick-calculators for either figuring dates in advance or the volume of a package, are made of Vinylite rigid sheet in disk form. The easily cleanable Vinylite has excellent dimensional stability at normal temperatures.

Graphic Calculator Co., 633 Plymouth Court, Chicago 5, Ill.



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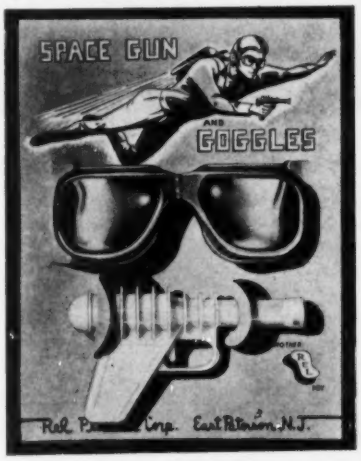

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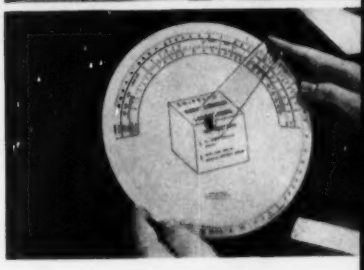
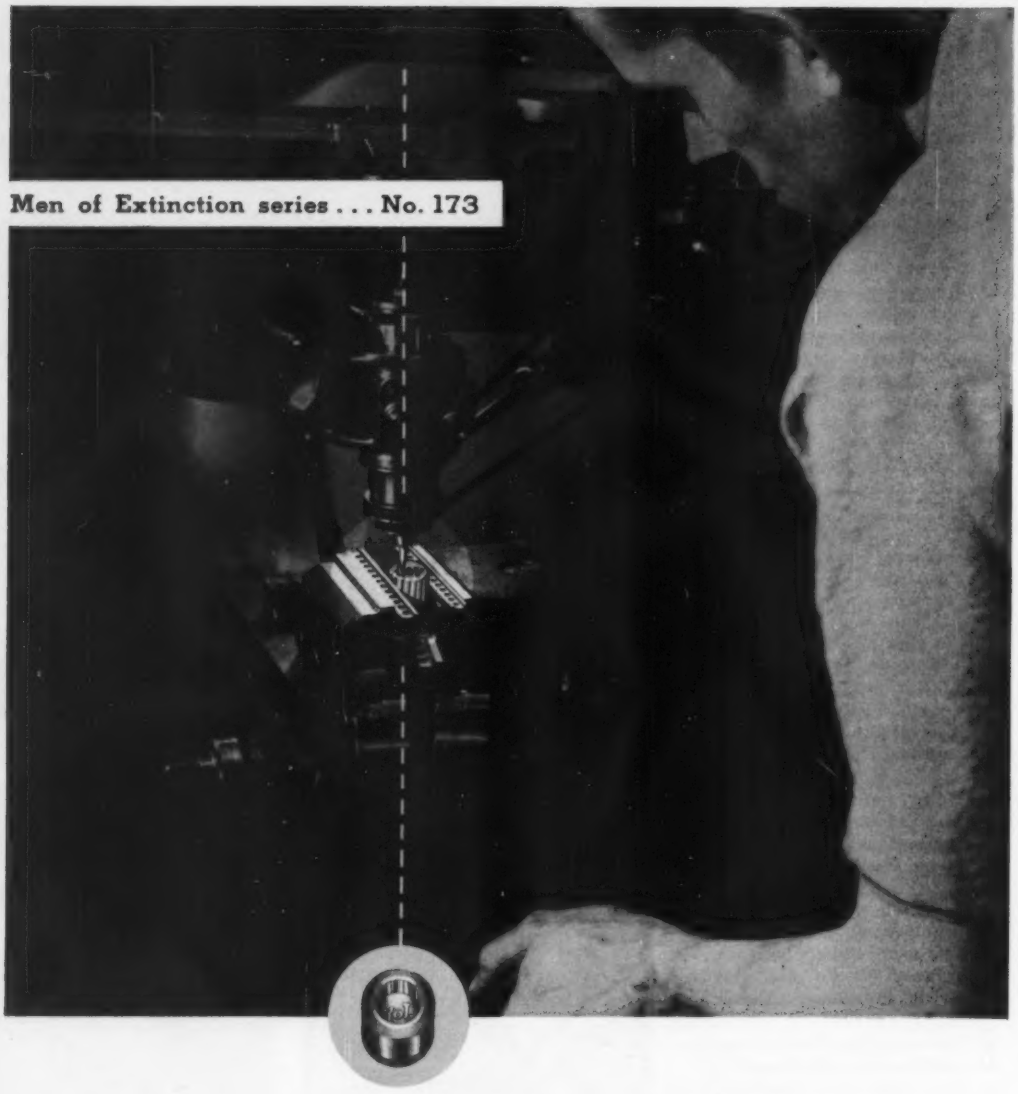


10

Men of Extinction series . . . No. 173



Nickodemus is one of a number of capable people whom we meet when prowling around the premises at MD&E. It is people like Nick who have a hand in making Hobbed Cavities by Midland. He qualifies as a man of extinction because he wants to monkey around triple-checking, thousandths, tens of thousandths, angles, contours, depths, etc. We're busy, and don't have time, but Nickodemus insists. We can't let him go because he owns the micrometer. Such is the situation at MD&E. Wherever sophisticated molders gather, the name Midland comes up when Hobbed Cavities are mentioned. Midland Hobbed Cavities, as you know, are proving every day that two things *are* alike . . . even 16 things . . . even 32 things, plastics units that is. If molding big or small plastics units in uniform multiple quantities, is your business, write Midland Die & Engraving Co., 1800 W. Berenice Ave., Chicago 13. Midland also makes plastics molds, die-cast molds, engraved dies, steel stamps, pantograph engravings.

Ship and Plane Testing Models

Details of production techniques, using polyester-glass, as applied at the David Taylor Model Basin

REINFORCED plastics are being widely used for experimental purposes at the David Taylor Model Basin. This establishment, essentially set up for the Navy, makes all of its facilities available for private industry use in testing by the use of scale models. Among other facilities, the establishment includes an aerodynamics laboratory as well as several towing basins.

For aerodynamic testing, the laboratory has wind tunnels for both super-sonic and sub-sonic work; a trans-sonic is being built.

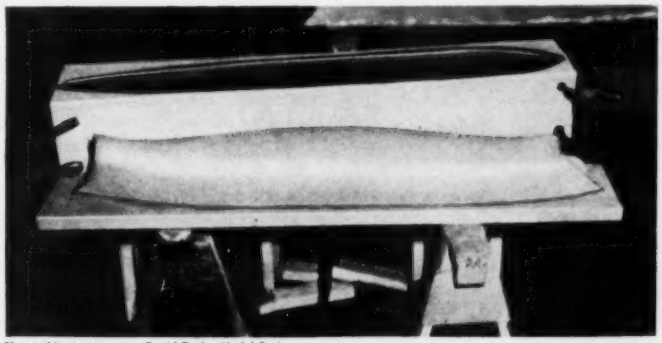
There are four towing basins on the station. The deep water basin, the largest of its kind in the world, is 2775 ft. long, 51 ft. wide, and 22 ft. deep. Models up to 32 ft. long, 5 ft. wide, and weighing as much as 5 tons can be tested in it. The shallow water basin is 303 ft. long, 51 ft. wide and 10 ft. deep, and joins one end of the deep water basin, doubling back upon itself in a J-shaped curve to form a turning basin. The high speed basin is 2968 ft. long, 21 ft. wide, with ⅓ of its length having a depth of 10 ft. and the remainder a depth of 16 feet.

Five towing carriages are available. Three are equipped to tow models at normal test speed; the fourth is a "noiseless" carriage; the fifth can tow models in the high speed basin at speeds of 60 knots.

Wood Replaced

Since 1900, models for use at the testing establishment have been produced from sugar pine, mahogany, or balsa wood, since these seemed to be the only materials which would not soften or distort during the hot humid weather encountered in Washington, D.C. summers. European model basins have used wax for ship model construction almost entirely, because it is cheap, easy to work, and their summers are usually cooler and less humid. With the recent development of synthetic waxes, it was considered probable that a wax composition could be developed which would stand high temperatures without distortion, and be strong enough to permit the installation of complicated appendages required on present-day models.

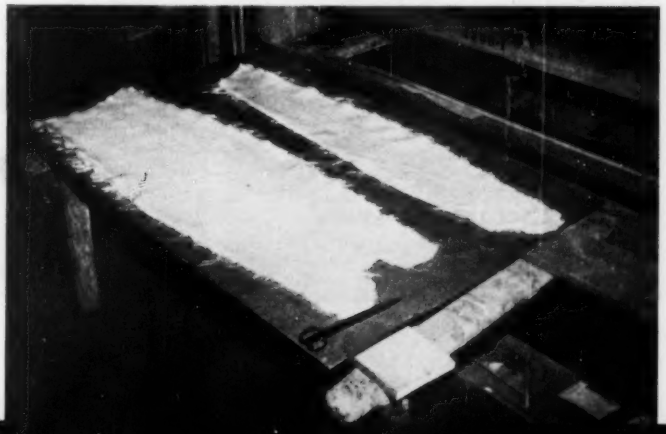
Considerable research and experimentation have been conducted at the Taylor Model Basin along this



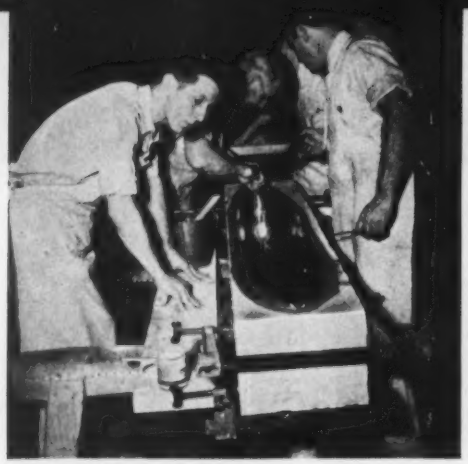
Photos this story courtesy David Taylor Model Basin

Balloon shaped to contours of boat mold is formed from latex coating sprayed into mold; latex-coated board is cemented to edges of balloon and entire unit removed

Cut layers of glass fiber cloth, which range in thickness from 0.003 to 0.015 in., are especially tailored to closely fit the contours of the female model boat hull mold



*Reg. U.S. Patent Office



Before fitting in Fiberglas cloth, operators coat interior of mold with a polyester paste to which color has been added

Tailored layers of the Fiberglas cloth are then carefully laid up by operators to correspond closely with contours and shape of coated boat mold

line, and a wax and polyethylene composition has been found which is useful for some types of ship models. Because of the heavy weight of wax, however, it cannot be used on some shallow-draft ship models. Accordingly, personnel at the Model Basin have been experimenting with the use of Fiberglas cloth and polyester resin laminates for both its ship and aircraft models.

Several models have been made and tested in wind tunnels and model basins. The following advantages over wood or paraffin models have become apparent: The models are lighter and thus are easy to handle, yet in most cases they are stronger than other types. This added strength is a special advantage for aircraft models which will be used in high velocity wind tunnel tests. More room is left inside the model for instruments, since the polyester-glass hull or shell is much thinner than in either wood or wax models. The plastic models can be ballasted much more accurately than other kinds, and color can be added to the bonding resin, thereby eliminating at least one or more coats of paint. This coloring will not dull or fade as will paint. The plastic models pick up much less moisture from the air and water.

Modifying Models

It is often desirable to modify a model after it has been tested and it was found that the Fiberglas-polyester models are much more simply modified. It is necessary only to alter the original pattern and mold, and remove from the model the section that is to be altered. The model is then placed in the altered mold, and the added section is built up with impregnated glass cloth or

Polyester paste is applied to each layer of Fiberglas as additional mats are laid on until a desired thickness is reached

Latex-coated board on which the shaped balloon is mounted is placed over the mold and securely clamped in place; air pressure is applied to balloon

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The Gruen Watch Company, like many other makers of fine products, found that BEETLE is priced right, molds easily and economically, resists staining, *and can be had in any color.*

So consider BEETLE for packaging... housings, closures, boxes, bases...both beautiful *and* practical.

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AMERICAN *Cyanamid* COMPANY

PLASTICS DEPARTMENT

32 Rockefeller Plaza, New York 20, N. Y.

Mold and latex-coated board are securely clamped together and kept 24 hr. under pressure for curing; the air pressure expands balloon into contact with Fiberglas

After curing process, board and attached deflated balloon are taken from mold and the boat hull removed; model is finished by removing surplus material and polishing

Spray technique in the forming of the shaped latex balloon facilitates the production of many shapes; shown below is balloon and mold for a half section of model plane

mat, after which the curing process proceeds in normal manner. The new section becomes an integral part of the original model.

When a number of identical models are required, a great saving in the cost of each model is made, since the mold and its appurtenances can be used many times.

Many different types of resins, catalysts, fillers, and reinforcing agents are being tried in this development work, and the method and process described below cannot be considered finalized. However, very successful models have been produced by the following procedure.

Making the Mold

An accurate pattern is first made of wood or wax for the hull, fuselage, wings, or control surfaces of the model to be studied. This pattern is finished with lacquer and coated with a hard wax which is subsequently highly polished. This hard wax finish facilitates release of the pattern from the mold. The waxed pattern is then coated either with an Armstrong epoxy resin (Armstrong Products Co., Warsaw, Ind.) properly mixed with an activator, or with a mixture of 50% tin and 50% bismuth, sprayed, in a molten state, from an electrically heated metal spray gun. The thickness of this coating varies from 1/32 to 1/8 in. according to strength requirements, which are controlled to a great degree by the size of the model being constructed. After this coating is applied, the pattern is suspended in a box, and the box is filled with Hydrocal B-11 (U. S. Gypsum Co., Chicago, Ill.) mixed with water. When this hardens it serves as a backing for the resin or metal shell. The pattern is then removed from the supported shell.

Next step is to spray or brush liquid latex into the mold until a layer about 1/32 in. in thickness is built up. A board large enough to cover the mold is sprayed or brushed with latex, and cemented to the edges of the latex coating in the mold. A valve is then inserted in the board in such a way that when air or hydraulic pressure is applied to this valve the 1/32 in. thick latex coating in the mold, which is actually a rubber balloon shaped to the size and contours of the mold, will be inflated. Since additional steps are required before

Can you top this?

Here's a manufacturing story that's really a "topper"! It's the story of Vibrin plastic and what it did for this jaunty Jaguar convertible.

Vibrin polyesters, combined with glass fibers, made possible a custom-built, detachable hard top* with new strength, new lightness, and new durability. And at relatively *low cost!*

So light (only 21 lbs.) it's no job at all to put it on or take it off — in just three minutes!

So strong you just can't dent it! This Vibrin laminate springs right back into shape after a blow that would ruin any ordinary top.

So tough it lasts the life of the car! Just refuses to rust or rot, or be bothered by weather in any way.

And soundproof, too! This Vibrin top deadens road and engine noises to give a ride that's quiet as a whisper.

Good news for Jaguar owners? You bet! And even better news for *manufacturers.* Because this unusual new reinforced plastic has a way of making all sorts of products better than they ever were. Needn't tell you it will pay you to see how Naugatuck's Vibrin can help *your* product. Why not send us the coupon below, today?

* * *

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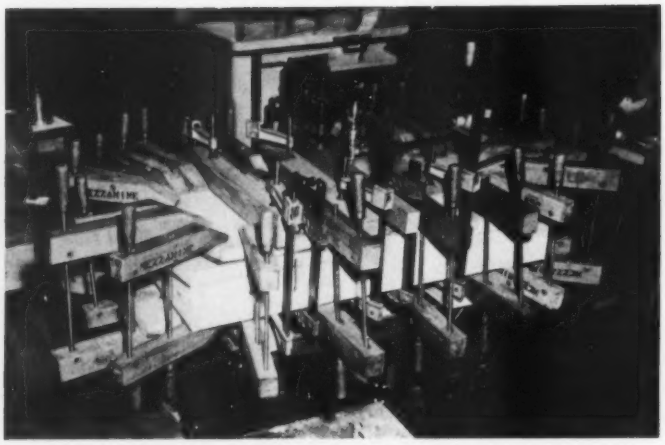

Need for maintaining close contact between latex-coated board and female mold necessitates use of clamps securely fastened at various key points around the unit

Half section of the plane model which was illustrated on preceding page is removed from the mold preparatory to cementing it with the other similarly prepared half

the balloon will be used, it is removed from the mold.

Formula for Paste

A number of layers of Fiberglas cloth varying from 0.003 to 0.015 in. thick are now tailored to fit the mold. In some cases Fiberglas mat or shredded cloth are also used for reinforcing certain sections. The surface of the mold is next coated with polyvinyl alcohol dissolved in water, and when this is dried a silicone release agent is applied over the polyvinyl alcohol. The mold is then coated with a polyester paste to which color has been added. The formula for this paste is as follows: 180 grams Paraplex P43 (Rohm & Haas Co., Philadelphia, Pa.); 20 grams styrene thinner; 12 grams color, stirred well; 4 grams cobalt, stirred well; and 3 grams of catalyst, stirred well (60% methyl ethyl ketone peroxide in dimethyl phthalate.)

The proportions of cobalt and catalyst vary to a slight degree, depending upon the speed desired for gelling and subsequent final cure. The tailored layers of glass cloth are then fitted into the mold, and as each layer is laid up it is coated with the polyester paste. Additional layers of cloth are inserted in the mold until a shell has been built up which will measure from $\frac{1}{32}$ to $\frac{1}{4}$ in. thick after molding.

The board on which the shaped latex balloon is mounted is then placed in position on top of the mold, and securely clamped in place. Air pressure governed by a regulator to from 10 to 30 p.s.i. is then applied. This expands the shaped rubber balloon so that intimate contact and uniform pressure are made at all points on the lay-up. No added heat other than that which is attained by the exothermic action from the plastic mixture is required.

Finishing the Model

After approximately 24 hours under pressure the balloon is deflated and removed. The cured model is then easily removed from the mold, after which the surplus material on the top edge of it may be either sanded, filed, or removed by a portable electric saw or router. The surface of the model is then highly polished with fine sand paper or other suitable rubbing compound. Transparent acrylic decks and cover plates are sometimes added, and other required appendages are installed.

Some ship models and most aircraft models are made in two half sections, and subsequently bonded together, generally by using the same resinous mixture with suitable reinforcing materials as the bond. Generally speaking, however, the model and mold techniques vary little from that which has just been described.

When very small models are required, it is seldom necessary to make use of the inflated balloon technique. Instead, a rubberized plastic molding material, Plastiflex (Calresin Corp., Culver City, Calif.) which can be remelted and used many times, is used to make a male core. In this case pressure on the polyester-Fiberglas lay-up is mechanical.

The David Taylor Model Basin wishes it to be known that all of their methods and techniques used for making plastic models may be seen at the model basin, and interested parties should contact the Director, David Taylor Model Basin, U. S. Navy, Washington 7, D. C.

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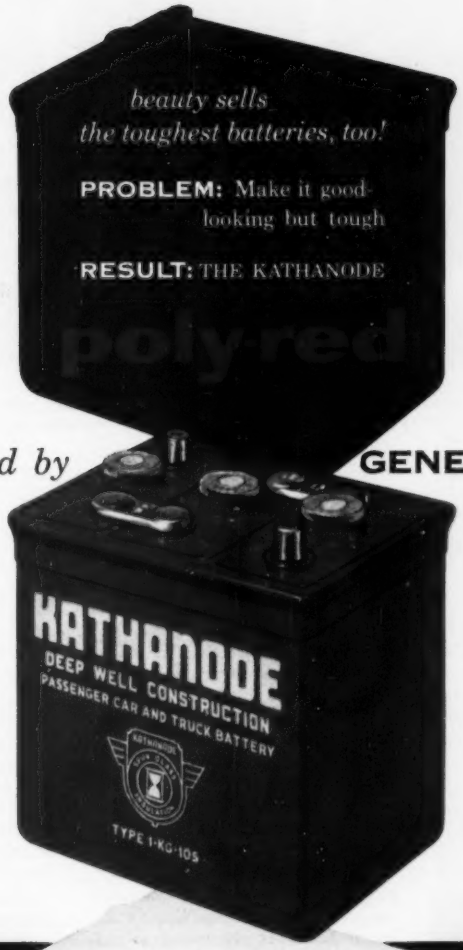

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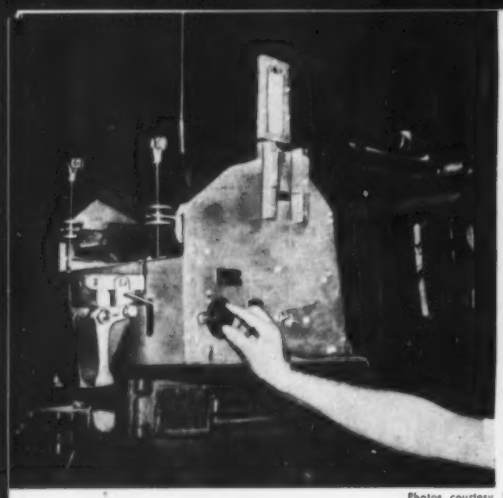


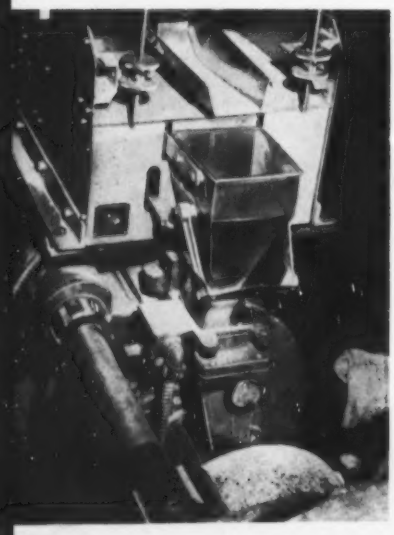
Photos courtesy Desimone Corp.

Desired weight of material for precision charging injection machine is dial-set on unit using weigh feeding principle

Material is conveyed from supply hopper through electrical vibratory feeder to weigh bucket mounted on a beam; unit is installed in place of regular hopper

Weigh Feeding

STARVING the feed to the heating cylinder of injection machines is one method of holding the softened plastic in the mold without packing in more than is required while the gate is solidifying. This is especially true in molding polystyrene sections over ⅛-in. thick, according to Gordon B. Thayer, Dow Chemical Co., Midland, Mich., who claims that the key to the difficulties encountered in molding heavy styrene sections is the technique of trapping the correct amount of plastic in the mold under the minimum required pressure. Mr. Thayer has further stated that a difficulty in the attaining of this condition accurately and continuously is that conventional injection machines have volumetric measurement for each mold charge, and that because of the variation in the bulk factor of granular or pelletized materials, volumetric measurement is not sufficiently accurate. He has therefore recommended weigh-feeding to overcome this problem.



Illustrated in the act of opening is weigh bucket gate which automatically discharges exact amount of material; flow of material from feeder to bucket is automatically cut when the predetermined weight is received

The Glengarry Equipment Corp., Bay Shore, N.Y., has recently developed a precision charging unit which makes use of the weigh-feeding principle. It is adaptable to most injection machines, and is installed on the machine in place of the normal material hopper. It is made up of four basic elements: a supply hopper, an electrical vibratory feeder, a weigh bucket mounted on a beam, and an automatically operated gate or door on the weigh bucket. In operation, the feeder uniformly conveys the material from the supply hopper to the weigh bucket. When the weigh bucket has received a predetermined weight of material, it causes a slight movement of the beam, which cuts off the current to the feeder, thus stopping the flow of material. At the proper time in the molding cycle, the gate on the weigh bucket is automatically opened and the accurately weighed charge of material drops into the injection chamber. The entire cycle is synchronized with that of the molding machine.

This charging unit is adjustable over a range from ½ oz. to 80 oz. per charge, and the company states that larger capacities are available upon special order. Its accuracy is said to be within a few grams.

Additional advantages claimed are that a shot made when using this weigh-feeding device will be lighter in weight than one made when using volumetric feeding; a mold is less likely to flash, and molded parts will have less internal strains, therefore reducing the necessity for after-annealing.

One of these units is installed on an injection machine at the A. J. Desimone Corp., East Paterson, N.J., and has been in successful operation for some months. One or more units are also in operation at such leading injection molding plants as the American Hard Rubber Co., Butler, N.J., Erie Resistor Corp., Erie, Pa., and the Presque Isle Plastics, Inc., Erie, Pa.

Finishing Machine Does Five Jobs

Color printing, production of a new wipe-shading effect, coating or lacquering, and color tipping of embossed stock can all be done with a single piece of equipment

OF particular interest to the plastics film finishing industry is a new German-engineered machine now on the American market. With this single unit, and relatively simple adjustments, five different finishes can be applied to plastics film. These finishes are: single color printing (either gravure or letter press); wipe-shading, rapidly gaining popularity under the name of Glamor-Shading; coating or lacquering; and color tipping of already embossed stock.

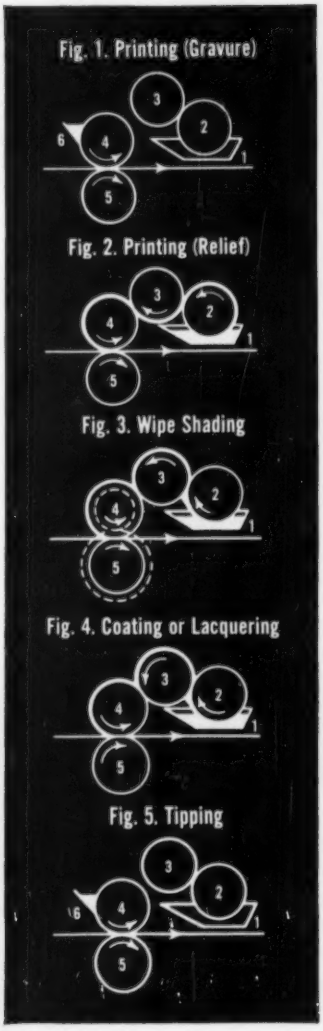
This machine, designed and built by Dornbusch Co., Germany, and being distributed by F. A. Ringler Co., New York, N.Y., is known as the Dornbusch No. 43 finisher. It has a 63-in. working width to handle plastics films up to 62 in. wide and is 8 ft. long, 4 ft. 7 in. deep, and 7 ft. high. It is equipped with four rolls, a doctor blade assembly, and a color fountain, which are used in various combinations according to the work to be done. Adjustment of the rolls is so precise that even fine Echolux* or riffle engraving work can be wipe-shaded on the machine.

The five parts of the accompanying drawing show schematically how the components of the machine are linked to produce the finishing effects already listed. In each sketch the following parts are shown: 1) color fountain; 2) pick-up roll; 3) furnisher roll; 4) printing or applicator roll; 5) counter roll; and 6) doctor blade assembly.

How Effects are Obtained

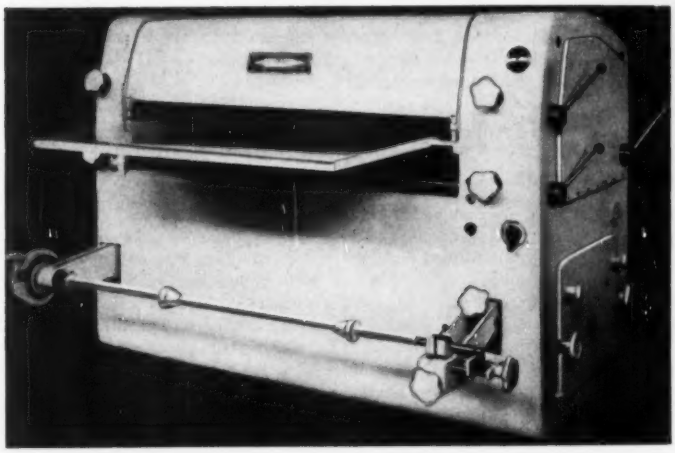
When gravure printing is to be done (Fig. 1), only two of the rolls and the doctor blade assembly are used. Levers on the machine disengage the rolls 2 and 3 as well as the color fountain. In this work, the doctor blade assembly also functions as an ink trough to apply ink

* See MODERN PLASTICS, December 1950, p. 72 for details of this process.



Schematic diagrams of component parts of film finishing machine, showing how they are linked to produce the wipe-shading and the other effects

Versatile machine for the plastics film finishing industry handles material up to 62-in. wide and can be equipped to process either continuous film or sheeted stock as desired



Some of the unusual surface finishes for plastics film obtained by wipe-shading (in which color is both applied and partially erased by a difference in speed between applicator and counter rolls) range from shaded riffle (center) to alligator and reptile

to the intaglio surface of the printing roll. The assembly can be accurately adjusted to control the amount of ink applied. As the film stock passes between steel screen roll 4 and the steel or rubber counter roll 5, the one color design is picked up by the surface of the film from roll 4.

For letter-press or relief printing, all elements are used. As shown in Fig. 2, color from the fountain 1 is picked up by rubber roll 2, transferred to steel furnisher roll 3, and applied to relief printing roll 4.

To obtain the wipe-shading effect, the set-up shown in Fig. 3 is used. Here the pick-up roll 2 is steel and the furnisher roll 3 is rubber. The quantity of ink applied to the furnisher roll is readily controlled by simple adjustments. The color is transferred from roll 3 to roll 4, where it is both laid down on and partially erased from the stock passing between rolls 4 and 5. The partial erasure or wiping, obtained by a difference in surface speed of the applicator and the counter rolls, results in the interesting effects shown in the photographs, ranging from shaded riffle designs to unusual alligator and reptile patterns.

Clear or single color coating or lacquering (Fig. 4) again uses all four rolls and the color trough but rubber applicator roll 4 and steel or rubber counter roll 5 have no differential in surface speed.

Color tipping of previously embossed stock is accomplished with the same set-up (Fig. 5) as for gravure printing. The color trough and rolls 2 and 3 are disengaged and ink is applied to the steel printing roll 4 in accurately controlled amounts by the doctor blade assembly 6. In this work, unusual effects are obtained by applying clear tipping or contrasting color to the top planes of the embossed design or impression. Through control of ink at the doctor blade and control of pressure between rolls 4 and rubber counter roll 5, varying degrees of contrast of the tipping color can be obtained.

This Dornbusch No. 43 finisher is supplied as a complete package, with motor, variable speed transmission, and complement of necessary accessory rolls. Blank printing rolls are furnished for gravure printing (Fig. 1), with the recommendation that the gravure design be applied locally. Standard equipment includes let-off and rewind for handling continuous film, but also available are feed and pick-up tables for handling sheeted stock.

Running speeds of the machine are adjustable according to the stock to be finished and the process being employed. The variable speed transmission permits synchronization with embossing equipment, either before embossing operation or after. Speed is infinitely variable from 4 to 26 yd. per minute.

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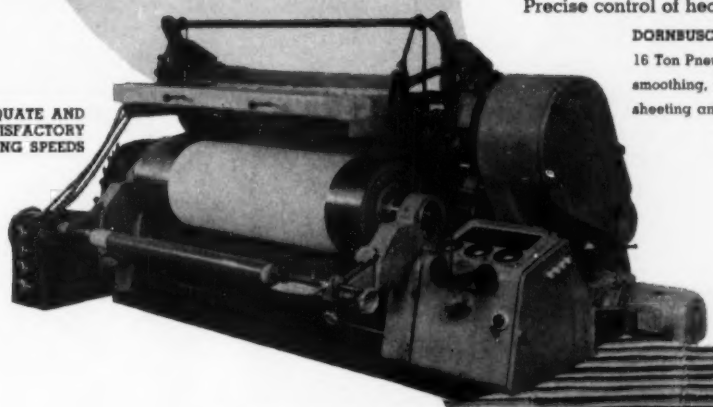

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Nylon-Phenolic Terminal-Board Material

by DAVID L. MATSON†

A SUPERIOR material for terminal boards—nylon-fabric phenolic-resin laminate—has been brought into use as the result of a test program covering numerous available types conducted during World War II. The new material is now available from a number of laminate suppliers. Its outstanding property is high insulation resistance in the presence of high temperature, humidity, and fungus exposure, but it also has high impact strength and low water absorption, along with fabricating qualities similar to the conventional paper-base phenolics.

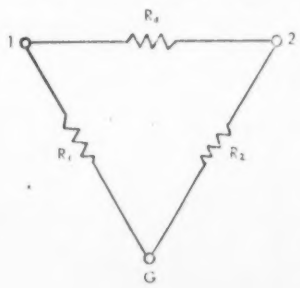
At the beginning of this program it was realized that there were many types of materials which in the temperate zone are suitable from electrical and mechanical standpoints. However, these materials did not maintain their properties under higher operating temperatures, higher humidities, and the presence of fungus. Auxiliary treatments, such as lacquers, waxes, and proprietary materials, were not considered a good solution. It was decided therefore to look for a material inherently having the desired characteristics together with fabricating properties which would provide an easily workable material. About 150 different types of laminates, submitted by numerous producers, were examined and tested.

Due to the rugged conditions under which certain civilian and military electronic equipment is used, terminal boards are essential for the support of small components such as ½- to 2-watt resistors, small capacitors, and radio-frequency chokes. Many of these components are in circuits of high impedance and must have stable electrical values. However, with the necessary terminal-board mounting, the values may be altered considerably by changing temperature and humidity conditions if these reduce the insulation resistance of the terminal material, which is effectively in shunt with the components. Therefore, insulation resistance under high temperature and humidity conditions after cyclic exposure to 70° C. (158° F.) at approximately 100% relative humidity down to −65° C. (−85° F.) was chosen as the main criterion for the materials tested. Specialized tests, such as arc resistance, chemical stability, creep and cold flow, insulation-recovery time, and resistance to fungus growth, were reserved for those materials passing this basic test. In order to decrease the effect of such variables as moisture evaporation, the measurements were made without removing the samples from the controlled temperature-humidity atmosphere.

Equipment and Procedures

Resistance Measurements—The measurement of resistance at relatively high levels in these tests required special care to eliminate the spurious effects produced by extraneous leakage paths. Any two terminals riveted normally in place on the specimen may be considered to constitute a three-terminal network, as shown in Fig. 1, where the resistance between terminals 1 and 2 (R_d) is the resistance to be measured, and the resistances R_1 and R_2 may be considered to be the leakage resistances to the guard electrode (in this case the metal wall of the humidity chamber). The resistance to be measured (R_d in Figs. 1 and 2) is connected to the "Unknown" terminals of the bridge, and the chamber wall is connected to the "Guard" terminal of the bridge and to ground. Thus R_1 shunts the bridge detector and R_2 shunts the fixed-resistance bridge arm F. Under these conditions, unless R_2 reaches a relatively low value (less than 10 megohms), the shunting will not influence the measurement of the insulation resistance R_d. A General Radio Megohm Bridge Type 544B with a 500-volt supply was used to conduct these tests.

Fig. 1—Three-terminal network resulting from resistances R_1 and R_2 to ground



Humidity Chamber—The high-temperature chamber includes a stainless-steel frame, indicated in Fig. 2, so arranged that the specimens are mounted solely by their connecting leads. These leads pass through a sloping wall, which forms part of the frame and, when in place, also forms part of the outside case. Each terminal of the specimens is wired with a separate #16 tinned copper wire of sufficient length to position the specimen in the center of the framework and terminate on the outside of the chamber with a short projecting length to connect clip leads. This frame is mounted in the metal high-temperature chamber, which contains the necessary

* Reg. U. S. Pat. Office
† Hazeltine Electronics Corporation

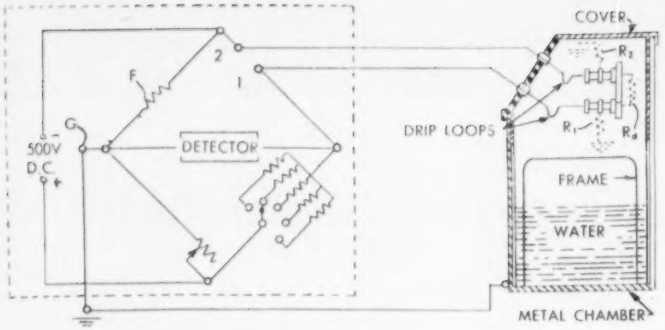


Fig. 2—Bridge circuit and high-temperature high-humidity chamber used in tests on terminal-board materials

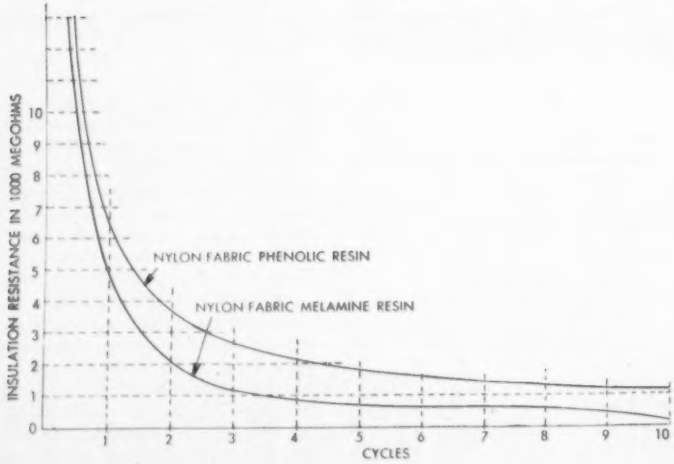
water, heaters, and temperature controls. When the frame is mounted in the chamber and the cover of the chamber closed, the interior is maintained at practically 100% relative humidity. In order to prevent condensation on the walls of the chamber, it is mounted in another temperature-controlled chamber, which is not shown in the diagram. In this manner the resistance measurements were made without the possibility of condensate forming on the specimens. When transferring the specimens from the high-temperature to the low-temperature chamber, it was only necessary to move the framework as a whole. This reduced the time necessary for thermal equilibrium of the specimens to be established.

Specimens—The dimensions of the specimens were 2¼ by 2¼ by 3/32 in. thick. Six terminals were riveted into the board material spaced on ⅜ in. centers in the form of a rectangle. Measurements were made between terminals 1 and 2, 2 and 3, etc., progressively and the seven readings were averaged. The various materials were tested as received. No attempt was made to condition the materials prior to testing.

Testing Cycle—The following repeated testing cycle was employed: 1) 17 hr. at 70° C. and approximately 100% relative humidity; the insulation resistance was measured at the end of this period while still in this chamber; 2) 4 hr. at −65° C.; 3) 3 hr. at room temperature to thaw out. Normally, all specimens were subjected to ten of these temperature-humidity cycles. Only when early failures were found were the specimens removed before the 10 cycles were completed. A material was considered to have failed when its insulation resistance under the test conditions dropped below 10 megohms, a value arbitrarily chosen to prevent needless extension of the tests.

Cast unplasticized polystyrene was used as a reference or control material, since it was found to have an almost unvarying insulation resistance of the order of one million megohms (measured between the ⅜-in. spaced terminals) under the high temperature and humidity conditions.

Fig. 3—Insulation resistance of phenolic and melamine materials after exposure to temperature-humidity cycles



Materials Investigated

The classes of resins included in this investigation were: phenol-formaldehyde, melamine-formaldehyde, urea-formaldehyde, aniline-formaldehyde, polyethylene, silicone, styrene copolymers, allyl alcohol and its copolymers, ethyl cellulose, polytetrafluoroethylene, and polyvinyl carbazole. The fillers used in conjunction with some of these resins included linen, paper, Fiber "A" (Du Pont), Fiber "G" (Du Pont), Fortisan, Fiberglas, nylon, and polyvinylidene chloride (saran, Velon).

At the outset about thirty-five laminators and resin producers in this country were contacted and informed of the characteristics which this laminate would have to possess. The response was generous and gratifying. Samples of numerous types were received and evaluated. Materials containing cellulosic type fillers such as paper and linen were eliminated at the start, because of the possibility of providing nutrition for fungus growth.

Some exploratory low-pressure laminating work was done in the Hazeltine laboratories to evaluate the influence of the filler material. Of all those tried, nylon and polyvinylidene chloride proved to be the most promising. Attempts made to produce high-pressure laminates using these materials proved to be most successful with nylon.

About this time Meccoboard Corp.

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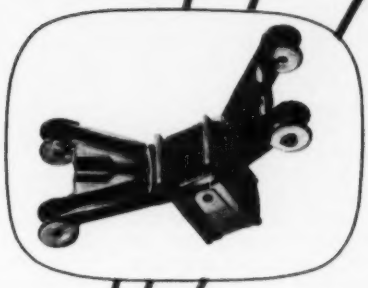

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in cooperation with Continental-Diamond Fibre Co. supplied us with experimental samples of nylon-fabric phenol-formaldehyde-resin and nylon-fabric melamine-formaldehyde-resin high-pressure laminates. Submitting these to the temperature-humidity cycling showed a high order of insulation resistance for both materials. However, the phenolic material exceeded the melamine by a substantial factor (see the curves in Fig. 3 for the resistance after various numbers of cycles). The insulation resistance in the case of the phenolic laminate starts at very high values (actually about 750,000 megohms) and drops rapidly during the first few cycles, after which it gradually stabilizes at approximately 1,000 megohms. Doubling the number of cycles did not substantially change the terminating insulation resistance for this material.

In the latter part of 1945, nylon-fabric phenolic-resin terminal boards were submitted to the Naval Research Laboratory, Washington, D.C., where tests were made of solder dipping, thermal cycling, humidity, vibration, and terminal strength.[1] After these tests N.R.L. subjected several samples to a 60-cycle 5-kilovolt rms potential applied between adjacent terminals (spaced 3/8 in. apart) without breakdown. The series of tests indicated the material to be able to withstand severe mechanical and electrical conditions.

[1]Naval Research Laboratory, Problem S-1061; IT July 1945.

Properties of Laminate

Measurements of insulation-recovery time[2] (Fig. 4) were made at 70° C. and 100% relative humidity. The insulation resistance, which varied at the start from 100 to 1,000,000 megohms, probably due to surface contamination, stabilized at approximately 1,000 megohms after about 500 hours. Samples were removed after the first 50 hr. and thereafter at about 100-hr. intervals. These samples were placed in an oven maintained at 0% relative humidity and 70° C. The measurements showed uniform recovery to about 1,000,000 megohms after about 20 hours. In all cases within 1 min. there was an immediate increase in insulation resistance to approximately 6 to 8 times its terminal value of 1,000 megohms in the 100% relative humidity.

The fungus-resisting properties were found to be satisfactory. Soil-burial and petrie-dish inoculation of the material caused no visible attack after 2 wk. in contact with the following micro-organisms: aspergillus niger, penicillium luteum, rhizopus negricans, monilia, and aspergillus amstelodann.

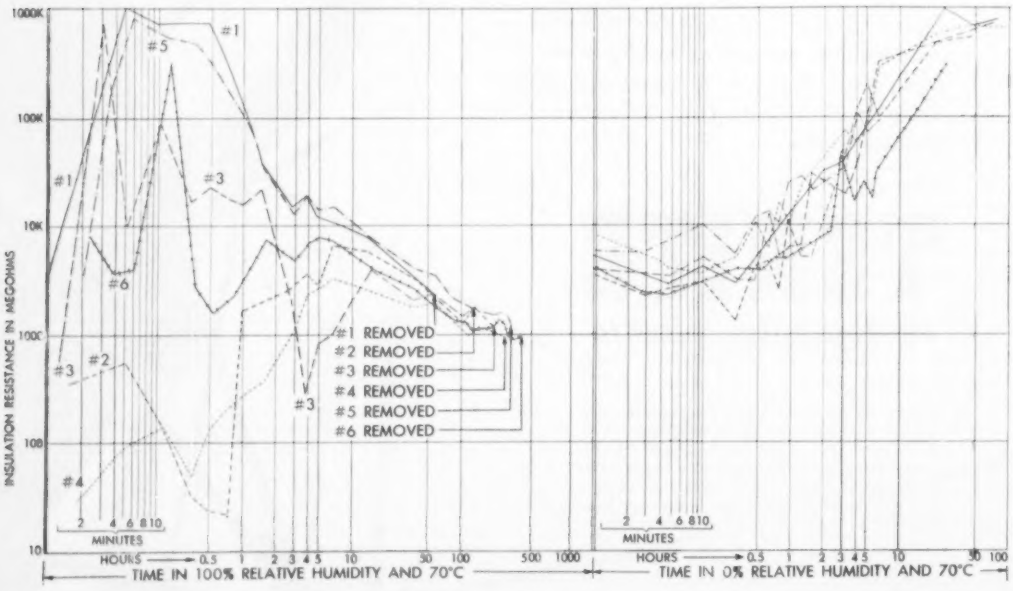
Some early attempts were made to increase the flexural modulus by interlaminating with glass cloth. A proportion of 25% Fiberglas cloth to 75% nylon fabric dropped the insulation resistance more than 1,000 times. Also, attempts to increase the arc resistance were made by laminating melamine-nylon material on the outer surfaces of the phenolic-nylon laminate. A similar result was obtained, i.e., the insulation resistance dropped considerably.

In an effort to reduce the cost while still maintaining insulation resistance at a high level, some manufacturers experimented with laminates having heavier fabric to reduce the number of plies. Using fabric that for a given laminate thickness required about one-third the number of plies, reduced the insulation resistance by approximately a factor of four. A reduction of about 50% in price was obtained by this modification. It was

(*Continued on* p. 212)

[2]Field, R. F., "How Humidity Affects Insulation," General Radio Experimenter, Vol. XX, Nos. 2 and 3, July and Aug. 1945.

Fig. 4—Insulation recovery of six nylon-fabric phenolic-resin terminal boards



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Evaluation of Finishes for Glass Fibers

by G. A. CLARK†

THE data presented by Bjorksten Research Laboratories[1], Garan Chemical Co.[2], and Owens-Corning Fiberglas Corp.[3] have shown that the new finishes developed by these organizations are a great improvement over that finish, designated as finish 114, used commercially until now. Data obtained by Wright Air Development Center confirm this improvement.

With regard to consideration of these finishes, it should be noted that the point of major importance to the Air Force is that the plastic laminates have the highest possible strength properties on high humidity exposure, because where these are lower than dry conditions, as is usual, design allowables must be based upon them. The strength properties include not only tension, compression, and flexure, but bearing, shear, fatigue, stress-rupture, etc.

Polyester laminates prepared with the presently-used glass fabric finish 114 show radical drop in strength on exposure to high humidity, about 40% drop in flexural strength on the average. Edgewise compressive strength is a limiting factor in the aircraft structural use of glass fabric plastic laminates because it is much lower than the flexural and tensile strength. This situation is aggravated for finish 114 glass fabric laminates because the compressive strength drops off under wet conditions about as much as the flexural strength, so that about 20,000 p.s.i. is all that is ob-

† Materials Laboratory, Wright Air Development Center.

[1] MODERN PLASTICS 29, 124 (July 1952).
[2] MODERN PLASTICS 29, 116 (Nov. 1951).
[3] MODERN PLASTICS 29, 126 (July 1952).

Table I—Comparison of Flexural Strength Retention by Laminates[a] Exposed 70 days to Various Conditions

Exposure condition	*Comparison based on strength at 75° F., 50% R. H.*	*Comparison based on strength at 100° F., 100% R. H.*
75° F., 50% R. H. (initial)	100	166
100° F., 100% R. H.	62	100
75° F., 100% R. H.	63	102
75° F., water immersion	64	105
75° F., 80% R. H.	71	118
75° F., 64% R. H.	77	128
75° F., 50% R. H.	85	141
2-hr. boil, tested wet at 75° F.	62	102
3-hr. boil, tested wet at 75° F.	59	95

[a] Average values for 181-114 laminates ⅛-in. thick prepared with several rigid polyester resins.

Table II—Wet Flexural Strength of Laminates[a] in Percent of Original Dry Strength for Various Finishes

Exposure condition	*Retention of strength when wet*			
	Finish 114, %	*Bjorksten Finish, %*	*Garan Finish, %*	*136 Finish, %*
30 days, 100° F., 100% R. H.	62	94	89	—
60 days, 100° F., 100% R. H.	—	—	86	—
90 days, 100° F., 100% R. H.	65	—	84	—
30 days, 75° F., water immersion	64	95	93	93
60 days, 75° F., water immersion	—	94	90	—
90 days, 75° F., water immersion	66	—	90	—
2-hr. boil, tested wet at 75° F.	63	—	92	92
3-hr. boil, tested wet at 75° F.	59	95	86	—

[a] See note *a* in Table I.

Table III—Wet Strength of Laminates[a] made with Different Fabrics in Percent of Dry Strength

Strength Retention Wet

Fabric	*Angle of loading, degrees*	*Tension, %*	*Compression, %*	*Bending, %*
112	0	75	77	65
	90	78	66	62
	45	63	—	—
116	0	78	58	62
	90	71	53	63
	45	59	—	—
128	0	76	59	56
	90	76	58	58
	45	60	—	—
162	0	72	58	65
	90	79	58	72
	45	68	—	—
143	0	81	63	52
	90	85	64	80
	45	63	—	—
120	0	84	70	61
	90	82	67	61
	65	60	—	—
181	0	83	69	61
	90	85	61	63
	45	66	—	—
182	0	88	64	67
	90	83	71	70
	45	64	—	—
184-	0	86	61	67
	90	89	64	67
	45	67	—	—
M503	0	76	43	55
Mat	90	76	40	58
	45	75	—	—
	Average	76	42	56
Average	0	80	64	62
(exclud-	90	81	62	66
ing mat)	45	63	—	—
	Average	75	63	64

[a] Resins and laminates conform to U. S. Air Force Specifications 12049 and 12051. The laminates were made with polyester resins and fabrics sized with Finish 114.

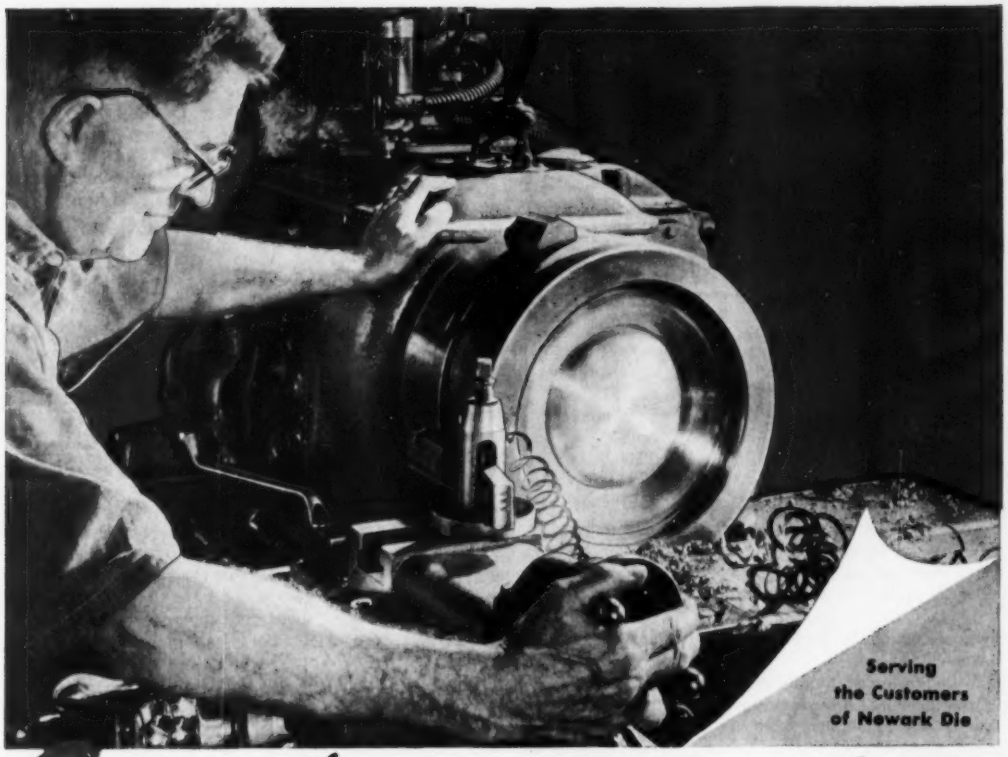

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Table IV—Comparison of Wet Strengths of Laminates in Percent of Original Dry Strengths

Material	*Tension,* %	*Compression,* %	*Bending,* %
Finish 114 on 181[a]	84	65	63
Finish 13 on 181[a]	—	—	60
Bjorksten finish on 181[a]	117	99	91
Garan finish on 181[a]	106	91	95
Polyester resins and Glass mat M503	76	42	56
Phenolic resin and cotton fabric (high-pressure laminate)	93	66	93

[a]See note *a* in Table I.

tainable in high strength laminates such as those made with 181 fabric. The effects of moisture on the room temperature stress-rupture and fatigue properties are also particularly severe with finish 114 glass fabric polyester laminates, as shown in Figs. 1 and 2. (See page 219.)

The wet strength reduction referred to for finish 114 fabric laminates have been checked consistently for numerous polyester resins and glass fabrics. Some of these data are given in Tables I to VI, inclusive.

Although high humidity exposure is the principal practical application, water immersion exposure is more convenient in testing. Table 1 shows that for finish 114 polyester laminates, water immersion is equivalent to 100% relative humidity exposure, and that as an accelerated test, 2-hr. boiling is also equivalent. The results after a 3-hr. boiling are not greatly different. This table also shows that humidities lower than 100% also cause substantial strength reductions.

The data in Table II show that equilibrium is attained in a 30-day exposure to humidity or water immersion as far as strength reduction for finish 114 fabric laminates is concerned. This conclusion has been confirmed by many tests. Results for a few tests for the improved finishes indicate that this also holds for them. In any case the new finishes maintain the high wet strength for long exposures. These data also indicate that the boil test may be used as an accelerated test for these finishes. The data in Table V show, for numerous polyester resins, the wet flexural strength retention of the new finishes. In general, the flexural strengths in the wet condition are 90% or more of those in the dry condition. The data also show that in absolute values, the Bjorksten finish on the average results in higher dry and wet strengths than the Garan or Owens-Corning 136 finish. The disadvantage of the Bjorksten finish at present is understood to be the lack of production applicability compared to the other two. The results also indicate that the Garan and Owens-Corning finishes appear to give quite comparable results. Tables VI and VII (page 218) indicate tensile and compressive strengths are maintained under wet conditions by the new finishes as well as the flexural strength. Although data are not yet available on stress-rupture and fatigue, it is believed that these undoubtedly will also be substantially improved under wet conditions compared to finish 114.

An evaluation of the dielectric constant and loss tangent at 10,000 megacycles, of polyester resin glass fabric base laminates made with glass fabric sized with the new fin-

(*Continued on* p. 218)

Table V—Wet Flexural Strength Retention of 1/8-in.-thick 181 Laminates Made with the Various Sizings and Polyester Resins

	Bjorksten Finish					*Garan RS-49 Finish*					*Owens-Corning 136 Finish*					*Owens-Corning 114 Finish*				
Resin	*Dry strength (75° F., 50% R. H.)* p.s.i.	*Strength after 3-hr. boil* p.s.i.	*Retention* %	*Strength after 30-day immersion* p.s.i.	*Retention* %	*Dry strength (75° F., 50% R. H.)* p.s.i.	*Strength after 2-hr. boil* p.s.i.	*Retention* %	*Strength after 30-day immersion* p.s.i.	*Retention* %	*Dry strength (75° F., 50% R. H.)* p.s.i.	*Strength after 2-hr. boil* p.s.i.	*Retention* %	*Strength after 30-day immersion* p.s.i.	*Retention* %	*Dry strength (75° F., 50% R. H.)* p.s.i.	*Strength after 2-hr. boil* p.s.i.	*Retention* %	*Strength after 30-day immersion* p.s.i.	*Retention* %
Selectron 5003	71,200	69,600	98	—	—	54,800	50,600	92	52,300	95	59,100	58,500	98	60,900	103	54,500	39,300	72	38,600[a]	71
Selectron 5003	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	56,600	—	—	34,800	62
Selectron 5016	—	—	—	—	—	60,200	58,500	97	59,500	99	—	—	—	—	—	51,200	—	—	37,100	72
Selectron 5103	—	—	—	—	—	—	—	—	—	—	57,600	52,600	91	52,500	91	—	—	—	—	—
Laminac 4115	—	—	—	—	—	64,700	60,800	94	59,200	92	49,600	49,100	99	—	—	67,400	—	—	46,500	69
Laminac 4128	66,500	62,000	93	61,900	93	58,600	57,200	97	57,200	97	—	—	—	—	—	52,000	—	—	41,400	72
Laminac 4129	73,000	67,400	92	68,800	94	—	—	—	—	—	—	—	—	—	—	57,500	—	—	41,600	72
Paraplex P-43	72,500	67,500	93	—	—	56,100	59,000	105	59,400	106	64,500	56,100	87	60,200	93	55,400	—	—	44,300	78
Marco MR21 C-3	—	—	—	—	—	—	—	—	—	—	59,700	58,300	97	52,700	92	62,900	—	—	35,000	56
Marco MR28 C-3	67,800	61,800	91	—	—	—	—	—	—	—	—	—	—	—	—	53,500	—	—	35,200	66
Marco MR29 C-3	63,000	50,400	80	—	—	—	—	—	—	—	—	—	—	—	—	54,100	40,600	75	36,200[a]	67
Marco MR29 C-3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	56,100	—	—	34,300	61
Bakelite QRS-147	—	—	—	—	—	—	—	—	—	—	52,800	47,700	90	47,700	90	—	—	—	—	—
Plaskon 911	66,000	61,500	93	63,900	97	—	—	—	—	—	—	—	—	—	—	56,800	43,200	76	40,200[a]	71
Plaskon 911	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	50,000	—	—	35,300	71
Plaskon 920	62,700	51,000	81	54,300	87	52,900	48,200	91	47,900	90	—	—	—	—	—	46,700	—	—	32,200	69
Vibrin 132	58,600	51,400	88	56,000	96	—	—	—	—	—	—	—	—	—	—	54,000	—	—	37,700	64

[a]100° F., 100% R.H. 30 days.

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Low-Pressure Lamination of Silicone Resins†

by KENNETH R. HOFFMAN††

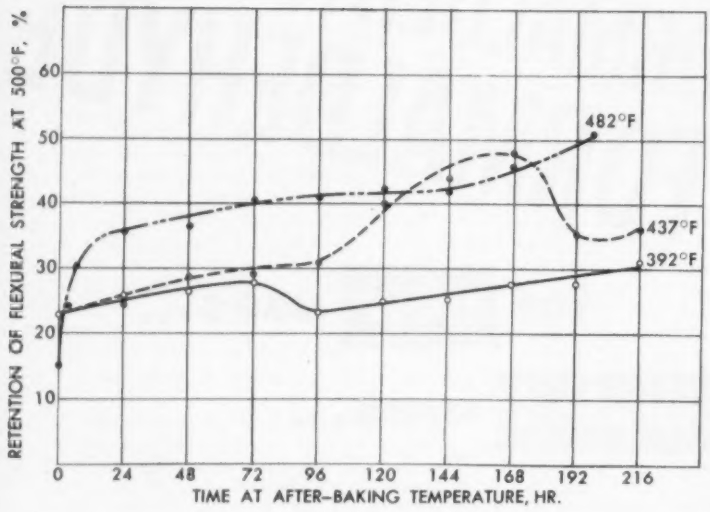
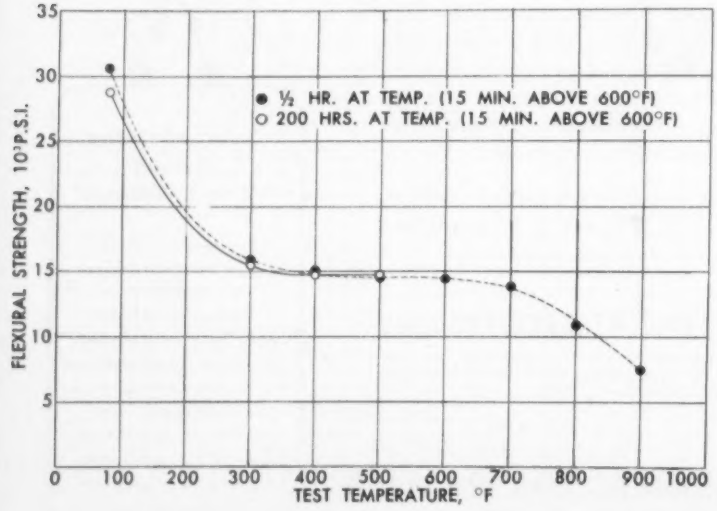


Fig. 1 (above)—Retention of room temperature flexural strength at 500° F. of low pressure laminates of Dow Corning 2104 silicone resin—181 glass cloth after-baked at various temperatures. Fig. 2 (below)—Flexural strength of Dow Corning 2104 silicone resin—181 glass fabric laminates at high temperatures



DURING the war low-pressure laminates using glass fabrics bonded with polymerizable organic resins were investigated intensively. This research proved the advantage of low-pressure laminating techniques for the production of molded parts having curved surfaces or large areas with relatively small outlay in equipment. Equally important were the properties of high strength, toughness, durability, water resistance, and electrical insulating properties of the laminates themselves. Because of the excellent heat stability of silicone polymers, it was inevitable that the silicone resins be investigated for the preparation of heat resistant laminates by low-pressure techniques. As a result of this research program, it has been found that Dow Corning 2104 silicone resin is suited for the production of laminates at pressures of 30 p.s.i. or less. This research is being continued, but sufficient evidence has been collected to indicate that the silicone resins may now be considered a permanent addition to the field of low-pressure lamination.

Low-pressure silicone glass laminates can be prepared from any glass fabric. Excellent laminates can be made from glass fabrics 112, 126, 128, and 181. Of these, 181 glass fabric is preferred because of the ease of handling and molding and the excellent properties obtained. The more open weave cloths such as 261, however, require special laminating techniques.

Studies were made on the effect of cleaning or sizing the glass fabric prior to coating with the laminating resin solution. Although much remains to be learned on the methods of cleaning and sizing the glass cloth, the results at the present time

† This article covers results of a project performed for the Air Force on a contract supervised by the Materials Lab., Research Div., Wright Air Development Center, Wright-Patterson Air Force Base, Ohio. The statements made represent the opinions of the author and not necessarily those of the Air Force.

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show that heat cleaning is the most satisfactory method for preparing the glass cloth to be used in silicone laminates. Recent studies have shown that the Bjorksten and Garan sized fabrics, which give excellent wet strength with the polyester resins, are also usable with 2104 resin. However, the data obtained show no advantage in using these sizings over the heat-cleaned cloth.

The properties of 2104 resin that make it well adapted to low-pressure lamination are the low initial viscosity at laminating temperature and a gel time that can be controlled by the use of catalyst No. XY-5, especially developed for use with silicone heat-setting resins. Because 2104 resin is adaptable to different types of lamination, the amount of catalyst employed will depend upon the laminating pressure. For low-pressure lamination the amount of catalyst is approximately 25% of the amount recommended for preparing post-formable or high-pressure laminates. The amount is based on flow or greenness tests and gel time tests in addition to trial lamination. Although these tests are carried out on each batch of resin it is well that the laminator himself carry out similar tests.

Flow and Gel Tests

A small piece of glass fabric 13 by 13 in. is impregnated with catalyzed resin solution and precured for 5 min. at 230° F. Three plies 3 by 3 in. square are cut on the bias and placed in the press at the desired laminating pressure at 347° F. for 5 minutes. If the three plies are weighed before lamination and reweighed after lamination, then the loss in weight divided by the initial weight times 100 gives the percent flow. When 181 glass fabric is used with 40% resin pick-up, flow value should be between 16 and 20%.

A gel time may be taken on another section of this same laminating stock. The most satisfactory method is to lay up 10 to 14 plies approximately 2 in. square, place them in the press at 347° F., and observe the actual time necessary for gelation of the resin to take place. Previous experience had dictated a gel time of approximately 2½ to 3½ minutes.

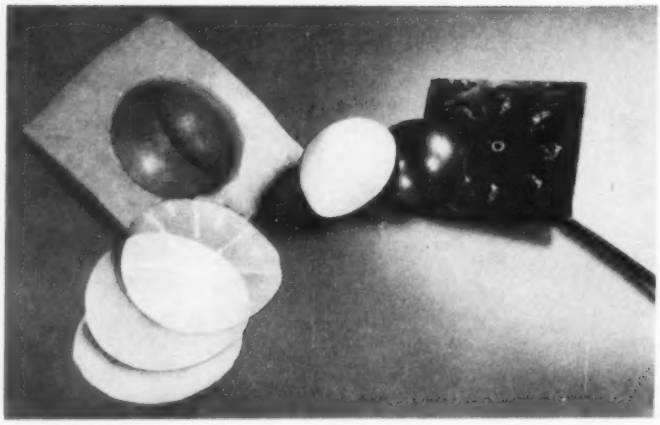

Fig. 3—Dome, 3 in. in diameter, is molded of laminates of silicone-glass by the vacuum technique, using an aluminum female mold and a silicone rubber bag under pressure

Table 1—Properties of Low Pressure Laminates[a] of Dow Corning 2104 Silicone Resin and 181 Glass Fabric

Flexural strength	
77° F., p.s.i.	25,000 to 35,000
500° F. (½ hr.), p.s.i.	12,000 to 15,000
Modulus of elasticity in flexure	
77° F., 10^6 p.s.i.	3.0 to 3.5
500° F. (½ hr.), 10^6 p.s.i.	1.9 to 2.5
Tensile strength	
77° F., p.s.i.	35,000 to 45,000
500° F. (½ hr.), p.s.i.	22,000 to 25,000
Modulus of elasticity in tension	
500° F. (½ hr.), 10^6 p.s.i.	2.5 to 2.8
Coefficient of thermal expansion, −58° to +392° F., per °F.	
α	2.7×10^{-4}
β	14.2×10^{-7}
Specific gravity	1.70 to 1.85
Water absorption, %	0.5 to 1.0
Weight loss, 500 hr. at 482° F., %	0.64
Arc resistance, sec.	350
Dielectric strength, ⅛ in., short-time, v/mil	250 to 380

[a] Laminates aftercured 150 hr. at 482° F.

Preparation of Laminates

Impregnation of Glass Fabric—After the amount of catalyst required has been set by test, the laminating stock is prepared. Low-pressure lamination necessitates the use of high flow resins. Due to the fact that it is necessary to remove the bubbles and voids and cause consolidation of the laminate by the flow of the resin rather than by pressure, it is necessary for some loss of resin to accompany this consolidation. For commercial production of laminates, however, it is also desirable that the resin flow be held to a minimum. Laminates with a resin content of approximately 30% give the best properties both at low and high temperatures. A 40% pick-up of resin has been found most satisfactory; however, this may be reduced depending upon the facilities available for lamination.

Heat-cleaned 181 glass fabric is impregnated with a catalyzed solution of 2104 resin. After the fabric is impregnated it may be allowed to air-dry for ½ hour. The cloth may be immediately precured for 5 min. at 230° F., but the air-dry reduces the tack considerably. The laminating stock is soft and tacky when re-

(*Continued on p. 219*)

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Vinyl Silicone Resin Treatment of Glass Fibers

by M. H. JELLINEK*

THE large loss in flexural strength of glass fiber-polyester laminates caused by water can be traced to the inadequate nature of the bond between the resin and glass. The treatment of heat desized glass with vinyltrichlorosilane has been previously disclosed.[1] This treatment apparently forms a vinyl silicone polymer on the glass with the liberation of hydrochloric acid due to the hydrolysis of the chlorosilane linkages present.

In an attempt to eliminate the use of acidic or acid-producing chemicals in glass treating plants, a silicone polymer was developed containing vinyl groups on each silicon atom. This resin is free of chlorine and is a neutral hydrocarbon-soluble polymer. This resin, marketed[2] as Linde Sizing GS-1, can be applied to desized glass cloth from a hydrocarbon solution and subsequently cured to produce a sizing on the glass having properties similar to those obtained by sizing with vinyltrichlorosilane. The over-all result of the application of this treatment is to cover the glass with a nearly continuous sheath of silicone. This sheath does not merely envelope the glass but is firmly attached either by some type of strong surface forces or actual chemical reaction with the glass. This protective sheath no longer permits wetting of the glass by water and is not seriously affected by breaks or fissures. Concomittantly the vinyl groups attached to each silicon atom in this sheath are available for double bond polymerization with suitable unsaturated resins.

The loading of the sizing on the glass can be controlled simply by adjustment of the concentration of the solution. For example, when glass fabric 181 with finish 112 (heat desized) is used, a solution containing 0.5% resin by weight yields 0.25 to 0.3% loading on the glass, while a solution of 0.8% yields a loading of 0.4%. Our investigations have covered the range to about 1% loading and the results show that below about 0.2% loading, the wet strength retention begins to fall off. Wet strength retention does not seem to be affected by the higher loadings but a definite decrease in dry strength becomes apparent above 0.5% loading.

It is interesting to note that at about 0.25% loading, if it were uniformly covered, all the glass fibers in 181 cloth would have a layer about 40 molecules thick on its surface. Why the same effect cannot be obtained with a layer only a few molecules thick is not known.

If laminates are made under constant pressure conditions, for example, 15 p.s.i., with the size loading on the glass the only variable, a definite relationship between thickness of the resulting laminate and size loading is observed. At 0.1% GS-1 loading, 10 plies of fabric 181 yielded laminates 0.10 in. thick, 0.35% GS-1 produced 0.12 in. laminates, and 0.75% GS-1 yielded 0.13 in. laminates. In other words a change in size thickness measured in millionths of an inch produced a 30% change in laminate thickness equivalent to 0.030 in. As the variation in resin content caused by these differences seriously affects the flexural strengths, spacers are used to assure reasonably constant resin content.

When clean glass cloth has been coated with GS-1 followed by heat curing at 275° C. (530° F.) for 5 min., it is possible to prepare translucent laminates of high dry strength which suffer little or no loss of strength in the accelerated humidity test involving boiling in water for 2 hr. followed by testing wet at room temperature. Typical results on laminates made from 181 fabric having finish 112 (heat desized), 114 (chromium methacrylate), and GS-1 are as follows:

Glass fiber finish	*Flexural strength Dry, p.s.i.*	*Wet, p.s.i.*	*Strength retention when wet, %*
112	48,000	22,000	46
114	50,000	30,000	60
GS-1	70,000	74,000	106
GS-1	59,000	55,000	93

The resin used in these tests was Bakelite BRSQ-147. In general, the dry flexural strengths of the laminates fell in the range of 60,000 to 65,000 p.s.i., but the table indicates the limits. One important effect is that the wet strength retention is relatively independent of the original dry strength. It is fairly obvious that GS-1 sizing permits the preparation of stronger laminates than were possible with the generally used finish 114, and that the wet strengths of such laminates are higher than the previously accepted dry strengths.

We have found that laminates having a high degree of transparency can be produced on GS-1 sized glass if the curing cycle for the resin is modified to include 10 min. at about 70° C. followed by final cure at 120° C. for 20 minutes. Neither these nor any other conditions we have tried have been of use in producing transparent laminates with cloth having finish 114.

It is common for different rolls of supposedly identical glass fabric to yield very different strengths when all other conditions are equivalent. In fact such differences are sometimes found within a given roll of cloth. We have found one cause for at least part of this difficulty as it affects GS-1 sizing. If the heat desized glass cloth has traces of alkali on its fibers, the properties of the sizing treatment are adversely affected. A test with indicator paper demonstrates the presence of this alkali and its removal merely involves washing in water. This wash can be given after the GS-1 has been applied.

The effect of GS-1 sizing is not

(*Continued on p. 154*)

* Linde Air Products Co., Div. of Union Carbide and Carbon Corp.

[1] "Vinyl Silane Size for Glass Fabric," by J. Bjorksten and L. L. Yaeger, Modern Plastics *29*, 124 (July 1952).

[2] In the experimental stage of its development, this resin was designated X-315.

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High Temperature Properties of Stypol 16B-Glass Cloth Laminates

by DR. F. G. SINGLETON†

THE need for high temperature laminating resins for missile structural parts was brought to the attention of the H. H. Robertson Co. almost four years ago. Through its Fellowship at the Mellon Institute, this company developed a polyester called Stypol 16B that was a substantial improvement over other similar materials that were available. Mechanical properties at 500° F. were 50 to 100% above the requirements for guided missile radomes as specified by the Air Materiel Command.

In tests made at 500° F., after exposure to 500° F. for 30 min., 181-114 laminates gave the following values:

Flexural strength, 10^3 p.s.i., 18 to 20.

Flexural modulus of elasticity, 10^6 p.s.i., 2.1 to 2.3.

Tensile strength, 10^3 p.s.i., 22 to 24.

Tensile modulus of elasticity, 10^6 p.s.i., 2.2 to 2.4.

Dielectric measurements on the laminates at 410° F. and 10,000 megacycles gave the following values:

Dielectric constant—412.

Loss tangent—0.023.

All of these results were obtained on panels made without special attention to void-free conditions. The panels were ¼ in. thick and 40 in. square. Laminating pressure was 10 p.s.i., and the resin content was 38 to 40% by weight. Stypol 16B laminates fabricated using the new finishes and techniques may have substantially improved properties. Work is being carried out in this direction.

Postcure does not improve the mechanical properties of Stypol 16B laminates. Stypol 16B laminates are unusual in that they show 100% retention of mechanical properties at room temperature and at 500° F. after exposure to humidity cycling as specified under Method No. 6011, Federal Specification L-P-406a.

As a comparatively low-cost resin, made from raw materials that are presently available in large quantities, Stypol 16B is being used successfully in the short term high temperature missile applications for which it was designed.

† Mellon Institute of Industrial Research.

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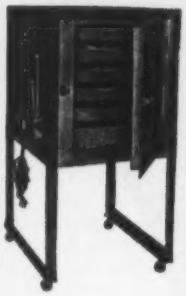

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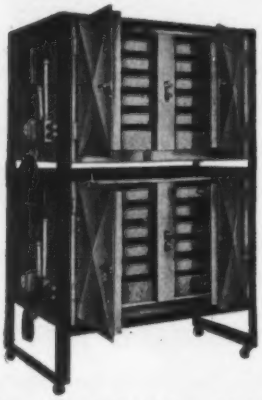

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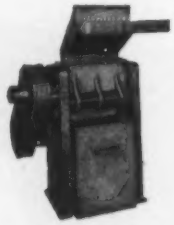

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Vinyl Silicone

(*Continued from p. 150*)

limited to woven cloth, but has also been applied with success to unwoven fibers and desized mat. In view of this there is no reason to believe that the treatment should not be generally useful where the attack of water on glass-resin interfaces is a serious problem.—END

Volan (114) Finish

by J. V. P. TORREY†

GREAT improvement in wet strength of laminates prepared from fabric with Finish 114 ("Volan" methacrylato chromic chloride) over the wet strength of laminates prepared from untreated fabric was a major factor in bringing recognition to the value of coupling agents for use in polyester laminates. When it was brought to our attention that the maximum strength properties desired for these laminates were not being realized with the "Volan" treated fabric currently produced, we initiated an intensive research program to determine what factors might be inhibiting the efficiency of the "Volan" treatment. The results of this study have been most encouraging. Laminates with dry flexural strengths in the range of 66,000 to 68,000 p.s.i. and wet flexural strengths after a 3-hr. boil in the range of 56,000 to 58,000 p.s.i. have been prepared from fabric treated in the laboratory by an improved process. These laminates contained 12 plies and had resin contents of 40 to 41%. The new "Volan" treatment has also greatly increased the transparency of the resulting laminates. The improved process for applying "Volan" to glass fabric is of such a nature that we anticipate being able to confirm these laboratory results in the plant, for trial runs are scheduled for the near future. The desirability of continuing to use "Volan" as the coupling agent is indicated by the improvement in its performance and by the fact that techniques for using fabric with this finish are well established through general use in the laminating field.

† E. I. du Pont de Nemours & Co., Inc.

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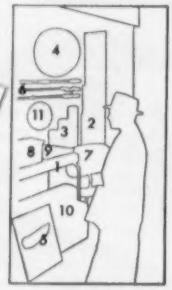

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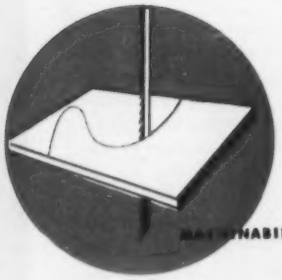

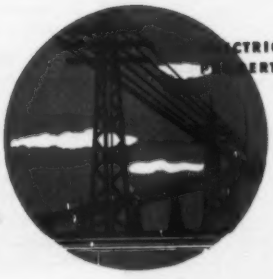

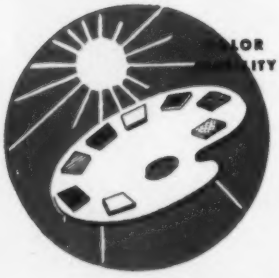

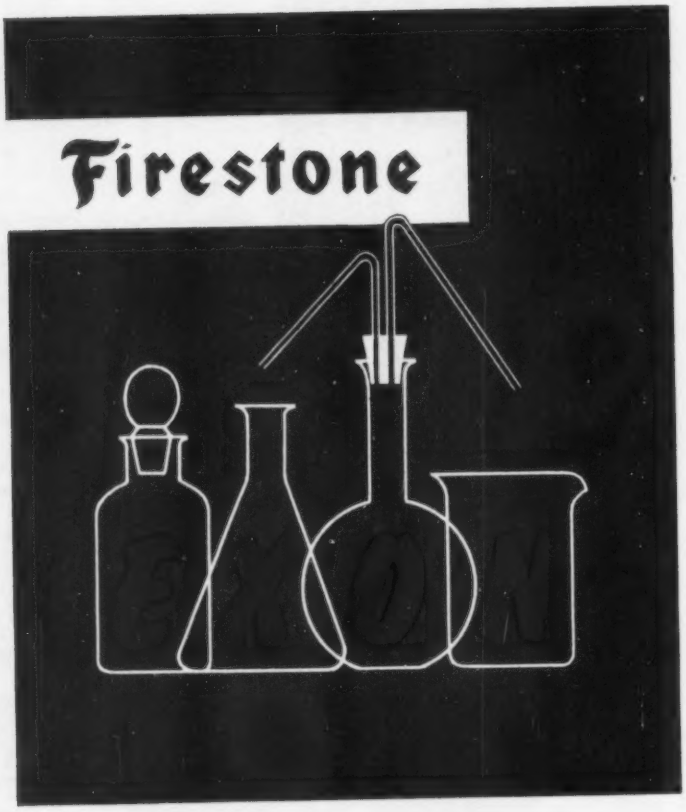

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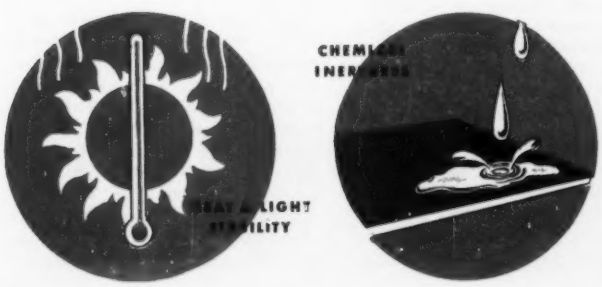

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PLASTICS DIGEST*

Abstracts from the world's literature of interest to those who make or use plastics or plastics products. Send requests for periodicals to the publishers listed.

General

WIDER DESIGN OPPORTUNITIES WITH THE NEW PHENOLICS. A. E. Javitz. Electrical Manuf. *49*, 112-17, 342, 344, 346, 348, 350, 352, 354, 356, 358, 360, 362 (June); *50*, 102-7, 264, 266, 268 (July); 92-6, 314, 316, 318, 320, 322 (Aug. 1952). Significant additions to the time-honored phenolic family feature the rubber-phenolic blends, the nylon-fabric-filled compounds, and the experimental glass-filled compounds. Commercially available general- and special-purpose compounds now successfully accommodate contemporary design demands for greater impact strength, dimensional stability under adverse atmospheric conditions, higher heat and flame resistance, better chemical resistance and improved dielectric properties, and provide faster cure and better flow. Recent developments in molding compounds, laminates, metal cladding of printed circuits, postforming, and foam-type materials are reviewed. Properties and applications are described in detail.

PETROCHEMICALS. J. F. Bohmfalk, Jr. Chem. Eng. News *30*, 1842-7 (May 5, 1952). The development and production of chemicals from petroleum, many of which are starting materials for the synthesis of plastics and rubbers, are reviewed.

FUNGAL REQUIREMENTS IN GOVERNMENT SPECIFICATIONS. S. Ruggeri. Electrical Manuf. *50*, 115-16, 302, 304, 306, 308 (Aug. 1952). Governmental specifications that have requirements for resistance to fungal growth and related test procedures are listed and classified.

Materials

SOME OBSERVATIONS ON THE DARKENING OF COMMERCIAL TRICRESYL PHOSPHATE. E. H. Searle and L. G. Whitlock. Brit. Plastics *25*, 235-7 (July 1952). The discoloration which may be encountered with tricresyl phosphate appears to be definitely associated with the presence of coal-tar impurities, of which the most important appear to be those of the aniline type. It is shown that a concentration of 0.02 to 0.10% of ortho-toluidine added to an otherwise non-browning tricresyl phosphate is sufficient to induce the color variations normally observed in storage. Despite this common background, however, marked variations in characteristics are observed with different samples. Useful simple tests, which give some degree of correlation with color stability and depend on color changes with cold sulfuric acid and heat treatments, are described. In many cases discoloration of polyvinyl chloride plastics due to tricresyl phosphate is negligible. For any particular application in which color is important it is essential to examine the actual performance in the plastic composition under consideration, comparing the tricresyl phosphate with a plasticizer less prone to discolor. Accelerated aging tests with ultra-violet and white light lamps can be misleading.

VINYL-TYPE POLYMERS CONTAINING PHOSPHORUS. C. S. Marvel and J. C. Wright. J. Polymer Sci. *8*, 495-502 (May 1952). Some copolymers which contain either aldehyde or ketone carbonyl groups were treated with phosphorus trichloride and then in sequence with acetic acid and water. On the basis of phosphorus analyses of the resulting products, α-hydroxyphosphonic acid groups are introduced in amounts ranging from zero to 100% of the theoretical amount. These phosphorus-containing polymers with 2% or more of phosphorus are somewhat flame resistant.

GLASS-REINFORCED ALKYD PLASTICS. M. H. Bigelow and P. E. Nowicki. Electrical Manuf. *49*, 110-13 (Apr. 1952). The properties and applications of a glass-filled alkyd plastic molding compound are reported. The chief advantages are outstanding arc resistance, exceptionally high impact strength, good dimensional and heat resistance, and fast curing at moderate molding pressures.

PLASTICS AND THE HONEYCOMB STRUCTURE. G. May. Brit. Plastics *25*, 201-5 (June 1952). Developments in the use of honeycomb laminates in Britain are reviewed. Containers, aircraft, truck bodies, furniture, and buildings are made of these materials.

SOME NEW BUTADIENE COPOLYMERS. C. S. Marvel, T. R. Fukuto, J. W. Berry, W. K. Taft, and B. G. Labbe. J. Polymer Sci. *8*, 599-605 (June 1952). Copolymers of butadiene with 2-ethoxyethyl methacrylate, tetrahydrofurfuryl acrylate, acrylic acid, and methacrylic acid were prepared and evaluated. The 2-ethoxyethyl acrylate copolymer has good low temperature properties. The methacrylic acid copolymer has unexpectedly good oil resistance, but the low temperature properties are poor. The acrylic acid copolymers show fair oil resistance and good low temperature properties. Both acrylic acid and methacrylic acid copolymers with butadiene show unexpectedly good tensiles.

PIGMENT COLORS FOR PLASTICIZED VINYL CHLORIDE POLYMERS. G. Wormald and W. F. Spengeman. Ind. Eng. Chem. *44*, 1104-7 (May 1952). Colored pigments are classified according to their chemical type and identified with respect to their characteristic behavior in plasticized polyvinyl chloride plastics. Lead-containing pigments frequently contribute to the heat stability of vinyl compositions. Their use with sulfide-containing pigments is to be avoided in order to prevent darkening. Acid-sensitive sulfide-containing pigments require special and careful stabilization to avoid sulfide odors. Since iron and zinc are known to catalyze the degradation of vinyl polymers, pigments containing these elements generally require special consideration, particularly with regard to the problems of stabilization. The presence of oxidation catalysts, such as manganese, in some vinyl formulations may promote rancid odor development and plasticizer exudation. The slight solubility in organic media of certain organic pigments makes careful consideration of bleeding and

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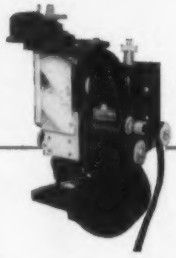

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crocking characteristics very important. Precipitated azo pigments are usually sensitive to the action of alkalies; therefore, special selection of stabilizers may be necessary in order to avoid stripping of the precipitating metal from the pigment molecule, thus changing its color as well as its crocking and migration characteristics. Crystal-unstable forms of phthalocyanine blue are sometimes subject to color and strength change when processed at elevated temperatures. For such special uses, crystal-stable forms of phthalocyanine blue should be used.

CAST PLASTICS FROM 2-FURALDEHYDE. O. R. Sweeney, L. K. Arnold, and J. T. Long. Ind. Eng. Chem. *44*, 1582-6 (July 1952). The effect of various additives on the strength properties of a plastic based on the polymerizing tendencies of 2-furaldehyde was studied. It was found that among suitable additives are secondary aromatic amines; certain furan derivatives such as furfurin, methylfuran, furfural acetone, 2,5-dimethylfuran, furfuryl acetate; and ligninsulfonic acid or preferably mixtures of ligninsulfonic acid with one of the other additives. p-toluenesulfonic acid was found to be an excellent condensing agent, resulting in a product having good strength but free from acid-diffusion difficulties encountered with other acidic reagents. Bromine also has advantages as a condensing agent. The resulting product is a hard, shiny, black material which is readily cast and which shows excellent resistance to chemicals. Products having flexural strengths up to 3800 p.s.i. were produced. Raw material costs are estimated between 12 and 25 cents per pound depending upon the condensing agent used.

TEFLON TETRAFLUOROETHYLENE RESIN DISPERSION. J. F. Lontz and W. B. Happoldt. Ind. Eng. Chem. *44*, 1800-5 (Aug. 1952). Tetrafluoroethylene resin is noted for its outstanding heat resistance, chemical inertness, antiadhesiveness, and extremely low dielectric loss properties and is commercially available in the form of granular molding powder and aqueous colloidal dispersion. This study was undertaken to furnish data on properties of the dispersion form of tetrafluoroethylene resin pertinent to film-forming, coating, and impregnating applications. The resin in

the form of aqueous colloidal dispersion can be coagulated in the presence of organic lubricants to form polymer-in-oil compositions. Work was undertaken to adapt these compositions for the extrusion of the resin below its transition temperature at 327° C. in order to circumvent some of the difficulties encountered in the high temperature extrusion of the polymer. The properties of this new polymer form are described with respect to particle size, shape, sedimentation, coagulation, and stability. Data on solids content vs. specific gravity and viscosity of stabilized dispersions are reported with a description of the film-forming properties. Preparation of films by a method involving casting, drying, and baking is described along with limitations imposed by "critical thickness."

PVC Wiring in Telephone Exchange Equipment. Brit. Plastics 25, 222-6 (July 1952). The properties and uses of an improved electrical grade of polyvinyl chloride as an insulating material in telephone equipment are described. This new product is superior to older grades in insulation resistance both dry and wet, heat deformation, and hardness.

Plastics for Automobile Bodies. Brit. Plastics 25, 218-21 (July 1952). The manufacture of an American motor car body of glass fabric and polyester plastic is described in detail. Developments in plastic motor car bodies in Europe are reviewed briefly.

Liquids in Film. Modern Packaging 25, 196-8 (Mar. 1952). The packaging of wet food products in sealed pouches of rubber hydrochloride film is described.

Hermetic Seals. R. O. McIntosh. Electrical Manuf. 49, 120-3, 328, 330, 332 (Apr. 1952). The advantages and limitations for encasing and embedding electrical components in plastics are discussed. The various types of commercially available products used for this purpose are described.

Properties

Gas Permeability of Films. A. H. Landrock and B. E. Proctor. Modern Packaging 25, 131-5, 191-201 (June 1952). A method for measuring oxygen and carbon dioxide permeabilities of sheet packaging materials, based on Dalton's law of partial

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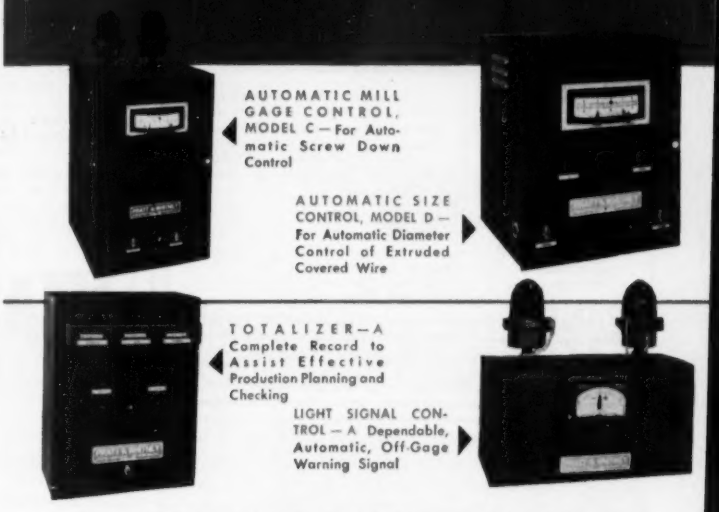
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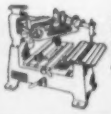

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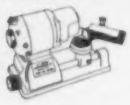

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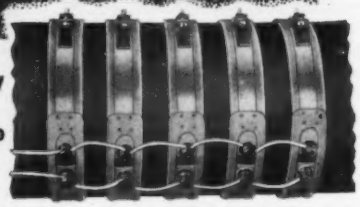

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pressures, is described. The test sheet is mounted between two chambers, the lower containing nitrogen and the upper swept with a mixture of oxygen and carbon dioxide. These gases permeate the sheet into the lower chamber at a rate dependent on their partial pressure differentials across the sheet. After small amounts of the gases have penetrated to the nitrogen side of the sheet, the gaseous mixture there is analyzed for oxygen and carbon dioxide. The results approximate actual packaging conditions, because the driving force across the sheet remains nearly constant and the pressures on both sides of the film are essentially atmospheric. Results are reported for a variety of sheet packaging materials and plastic films.

ARC RESISTANCE: TRACKING PROCESSES IN THERMOSETTING INSULATING MATERIALS. M. Olyphant, Jr. ASTM Bulletin No. 181, 60-7 (Apr. 1952). The processes by which conducting paths or tracks are formed in insulating materials exposed to low current arcs were investigated. For the purpose of discussion the tracking process is divided into two parts: track initiation and track propagation. The processes by which conductive paths are formed in insulation exposed to low-current arcs depend upon the conditions of the test. In general, failure is not instantaneous but requires the propagation of conductive tracks across the surface of the insulator. Such tracks act as extensions of the electrodes and under a-c arcs the extension of the track depends almost entirely upon the activity of the anode spot of the arc, little if any growth occurring during half cycles when the track acts as a cathode.

EFFECT OF CHEMICAL COMPOSITION ON SELECTED PHYSICAL PROPERTIES OF LINEAR POLYMERS. E. F. Izard. J. Polymer Sci. *8*, 503-18 (May 1952). A review of the data available in the literature and new data reported in this paper show that in any homologous series of condensation polymers there is a uniform change in the melting point as the hydrocarbon content of the polymer is increased. If all such series are treated as copolymers of the simplest modifying element and polyethylene and the composition expressed on a mole fraction basis, the data when presented graphically show that the melting points of any such series pass through a minimum at some intermediate composition. The position of the minimum as well as the depth of the minimum is dependent on the polarity of the modifying group. This survey included aliphatic polyesters, aromatic polyesters, polysulfides, cellulose derivatives, and polyamides. Some of the series are complete enough to show a definite minimum with compositions on either side of the minimum with higher melting points. In some compositions based on the very highly polar groups, such as amides, the series is not complete enough to establish the complete shape of the curve, but the indications are strong that the minimum does exist.

OXIDATION OF GENERAL-PURPOSE POLYETHYLENE RESIN. C. S. Myers. Ind. Eng. Chem. *44*, 1095-8 (May 1952). This study was undertaken with the objective of defining the mechanism of oxidation and related electrical loss characteristics of polyethylene resins. The power factor of

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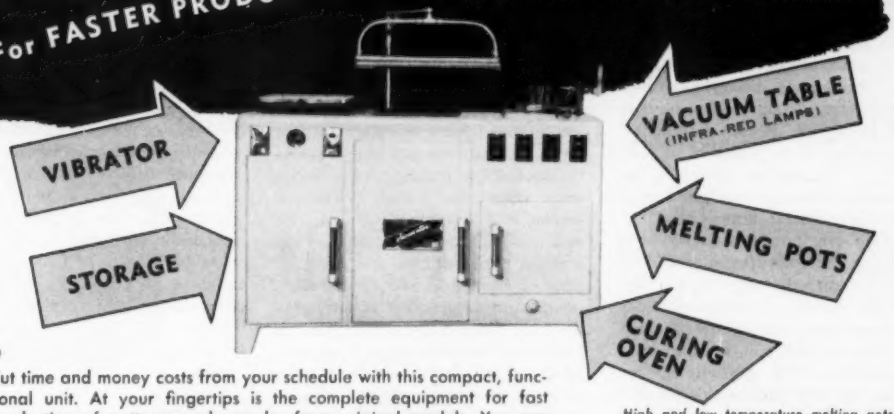

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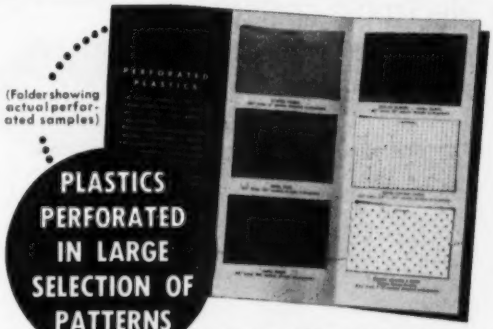

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IMPACT STRENGTH OF SOME THERMOSETTING PLASTICS AT LOW TEMPERATURES. J. J. Lamb, D. A. George, H. A. Baker, and L. E. Sieffert. ASTM Bulletin *1952*, No. 181, 67-70 (Apr. 1952). Izod impact specimens of five types of laminates and four types of thermosetting molding compounds were stored for 1 day, 1 week, 2 weeks, and 7 weeks at 0, -23, -40, and —55° C. and were tested at the storage temperatures. No effect of time of storage at low temperature on the impact strength at low temperature was observed. The plastics tested may be classified as to amount of change in impact strength in going from room temperature to low temperature as follows: small decrease —paper phenolic laminate and asbestos-flock phenolic molded bar; large decrease—cotton-fabric phenolic laminate and molded bar; small increase—glass-fabric silicone laminate and glass-fiber silicone and melamine molded bars; and a large increase—glass-fabric melamine and the glass-fabric polyester laminates.

A NEW TOOL FOR DETERMINATION OF THE STAGE OF POLYMERIZATION OF THERMOSETTING POLYMERS. G. A. Sofer and E. A. Hauser. J. Polymer Sci. *8*, 611-20 (June 1952). Studies of the change of attenuation and velocity of longitudinal ultrasonic waves with proceeding polymerization of thermosetting plastics reveal that this new technique may permit rapid determination of the stage of polymerization under various conditions. The ultrasonic equipment used for these tests is described in detail. On the basis of results so far obtained, future possibilities for the application of this new technique in studying polymerization reactions are outlined.

NEW BLOCKING-POINT TEST. H. M. Farnham, W. A. Herbst, and H. F. Hitchcox. Modern Packaging *25*, 257-60 (Mar. 1952). Apparatus and test procedure for determining the blocking point of waxes are described.

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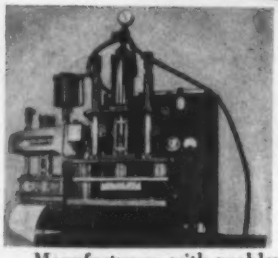

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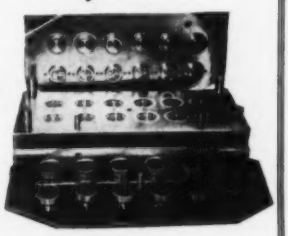

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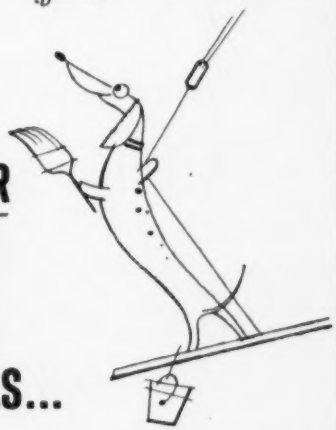

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POLYMERIZATION. F. M. McMillan and E. T. Bishop (to Shell Development). U.S. 2,601,673, June 24. Polymerization of styrene in the presence of 2,2,4,6-tetramethyldihydropyridine.

MOLDING. J. Pinsky and R. L. Zweygartt (to Plax). U.S. 2,601,700, July 1. Apparatus for blow-molding plastic bottles.

MOLDING. G. B. Sayre (to Boonton Molding). U.S. 2,601,701, July 1. Compression molding a plastic in sheet form.

LAMINATES. R. G. Nelb (to U. S. Rubber). U.S. 2,602,037, July 1. Fireproof laminated resins comprising glass fiber layers laminated with melamine resins.

COPOLYMERS. E. C. Haines (to G. D. Wetherill Varnish). U.S. 2,602,071, July 1. Copolymers of vinyl monomers with fatty oils, fatty acids, and resins.

MOLDED PRODUCTS. E. L. Kropa and J. P. Dunne (to American Cyanamid). U.S. 2,602,074, July 1. Hot-moldable copolymeric acrylonitrile molded articles.

FIBER FORMING RESINS. A. S. Carpenter, S. Coldfield, F. Reeder, and E. R. Wallsgrove (to Courtaulds). U.S. 2,602,075, July 1. Epichlorohydrin-dihydroxy phenol compositions.

RESINS. A. S. Teot (to Dow). U.S. 2,602,076, July 1. Oil-soluble phenolic resins.

RESINS. M. DeGroote and B. Keiser (to Petrolite). U.S. 2,602,077, July 1. Glycol ethers of phenol-acetylene resins.

RESINS. M. DeGroote and B. Keiser (to Petrolite). U.S. 2,602,079, July 1. Oxyalkylated derivatives of resinous polymers of vinyl esters.

RUBBER HYDROCHLORIDE. M. D. Coulter (to Wingfoot). U.S. 2,602,094, July 1. Plasticized rubber hydrochloride.

CELLULAR MATERIALS. T. R. Korkatti (to United Shoe Machinery). U.S. 2,602,193, July 8. Cellular composition of phenol-aldehyde, butadiene-acrylonitrile copolymer, and a blowing agent.

PLASTIC SOCKETS. J. E. Wilcock (to Pilkington Bros.) U.S. 2,602,269-70, July 8. Apparatus for forming undercut sockets in hot plastic material.

CHLOROPOLYSILOXANES. W. L. Walton (to G.E.). U.S. 2,602,728, July 8. Process for preparing chloropolysilanes.

PLASTIC RODS. R. J. Francis. U.S. 2,602,766, July 8. Reinforced rods comprising a fibrous yarn core impregnated with thermosetting resin.

CELLULAR RESINS. E. Simon and F. W. Thomas (to Lockheed). U.S. 2,602,783, July 8. Cellular foamed alkyd-diisocyanate resins.

RESINS. Q. T. Wiles and D. W. Elam (to Shell). U.S. 2,602,785, July 8. Glycidyl polyethers of dihydric phenols and polyvinyl acetate.

COPOLYMERS. S. B. Luce (to Swift). U.S. 2,602,786, July 8. Copolymers of maleic anhydride and an unsaturated ether ester.

RESINS. W. W. Crouch (to Phillips Petroleum). U.S. 2,602,787, July 8. Emulsion copolymerization of sulfur dioxide and unsaturated compounds.

CHLOROTRIFLUOROETHYLENE. J. J. Padbury and E. L. Kropa (to American Cyanamid) U.S. 2,602,824, July 8. Liquid polymeric chlorotrifluoroethylene.

TUBULAR CONDUITS. J. M. Fenlin. U.S. 2,602,959, July 15. Apparatus for continuously producing reinforced plastic tubing.

MOLDING. S. T. Deakin (to British Mechanical Productions). U.S. 2,602,962, July 15. Method of molding polytetrafluoroethylene.

COATED SHEET. A. F. Schramm, Jr. U.S. 2,603,575, July 15. Method for coating fibrous sheet with resin while still retaining the permeability of the material.

RESINS. P. E. Marling (to Monsanto). U.S. 2,603,611, July 15. Styrenated oil-all oil vinyl ester coating compositions.

VINYL CHLORIDE. J. Dazzi (to Monsanto). U.S. 2,603,615, July 15. Vinyl chloride resins plasticized with esters of phenyl phenoxy acetic acid.

RESIN COMPOSITIONS. L. W. Newton (to Carbide and Carbon). U.S. 2,603,616, July 15. Composition of a vinyl halide or a cellulose ester plasticized with esters of thiobis-dicarboxylic acids.

PLASTICIZERS. E. O. Hook and E. W. Cook (to American Cyanamid). U.S. 2,603,617, July 15. Plasticizing elastomers with N-isopropyl thiosalicylamide.

PLASTICIZER. J. Dazzi (to Monsanto). U.S. 2,603,619, July 15. Diallyl bisphenoxy acetate plasticized polyvinyl chloride.

ACRYLONITRILE. A. T. Walter and G. H. Fremon (to Carbide and Carbon). U.S. 2,603,620, July 15. Solution of acrylonitrile—vinyl chloride copolymer in acetonitrile.

STABILIZER. H. Berger and R. Linke. U.S. 2,603,622, July 15. Halogen-containing resin stabilized with an acetylene alcohol.

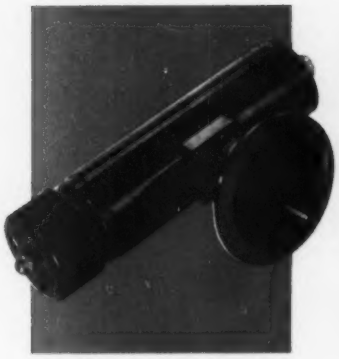
RESIN. F. A. Bonzagni (to Monsanto). U.S. 2,603,623, July 15. Reaction products of etherified methylol-melamine with alkali metal sulfites.

CONDENSATES. K. Keller and O. Hansen (to Cassella Farbwerke Mainkur). U.S. 2,603,624, July 15. Condensates of an aminotriazine and trimethylolacetaldehyde.

COPOLYMERS. R. C. Feagin and D. Bandel (to Mathieson). U.S. 2,603,625, July 15. Copolymers of dichlorostyrene and esters of olefin carboxylic acids.

POLYMERIZATION. J. J. Kolfenbach and A. B. Small (to Standard Oil). U.S. 2,603,626, July 15. Low temperature polymerization employing phosphorous pentoxide-treated alkyl halide catalyst-solvent.

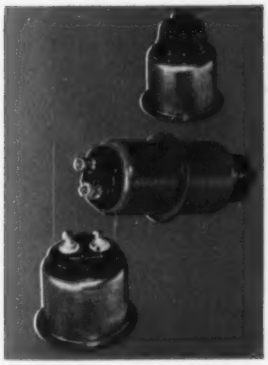
POLYMERIZATION. M. L. A. Fluchaire and G. Collardeau (to Societe des Usines Chimiques). U.S. 2,603,-



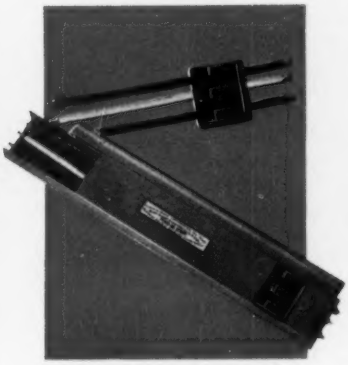
This X-ray tube housing has high dielectric and mechanical strength, withstands high operating temperatures. It's molded of BAKELITE Phenolic BM-7436, specially formulated to provide protection against radiation. **Made by Machlett Laboratories, Inc., Springdale, Conn.**

Molding speed was increased 15 per cent when BAKELITE General-Purpose Phenolic BM-18703 was selected for these wire connectors. They're low in cost, have good appearance, moisture resistance, electrical resistivity. **Molded by Ideal Industries, Inc., Sycamore, Ill.**

This impeller housing for a military radio transmitter is molded of BAKELITE General-Purpose Phenolic BM-120. It withstands vibration, shock, and temperatures ranging from —55 deg. C. to +70 deg. C. **Molded by Whitso, Inc., Schiller Park, Ill., for Collins Radio Co., Cedar Rapids, Ia.**



Resistance to vibration and to operating temperatures as high as 210 deg. F. are requirements of these primary and secondary end bodies for tractor ignition coils. They are met by BAKELITE Heat-Resistant Phenolic BM-12506, molded to metal housing. **Molded by Breyer Molding Co., Chicago, Ill., for International Harvester Co., Chicago, Ill.**



"Plug-in" strips, completely assembled, are attached to room walls to provide electrical outlets at regular intervals. Receptacles are molded of BAKELITE General-Purpose Phenolic BM-15140 for rapid production, good mechanical strength, and bleed resistance. **Made by National Electric Products Corp., Pittsburgh, Pa.**

The smooth, shiny finish, rich color, and clean design of this radio cabinet give it plenty of selling power. It's made of BAKELITE General-Purpose Phenolic BM-15155, easily molded, strong, low in cost. **Molded by Crosley Division, Avco Mfg. Corp., Cincinnati 25, Ohio.**

SIX SETS OF REASONS FOR SELECTING PHENOLICS

Heat resistance, good finish, impact strength, chemical resistance, electrical resistivity — these are just a few of the many properties that BAKELITE Phenolic Plastics can bring to a job!

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The broad range of BAKELITE Phenolic Plastics makes them useful for thousands of successful applications. Perhaps they can benefit your product. Look into them as a means of improving design, performance, production.

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Bakelite Company (Canada) Ltd., Belleville, Ont.

628, July 15. Polymerization of vinyl allyl ether.

POLYMERIZATION. H. S. Bloch (to Universal Oil Products). U.S. 2,603,-629, July 15. Dihydrocarbon peroxides capable of controlling polymerization reactions.

CELLULOSE ESTERS. G. W. Seymour, B. B. White, M. Plunguian, M. E. Martin, P. Blackman, and F. Fortess, U.S. 2,603,634-5-6-7-8, July 15. Processes for producing cellulose esters.

COPOLYMERS. D. E. Strain (to Du Pont). U.S. 2,603,655, July 15. Butadiene-alkylbenzene-olefin condensates.

POLYMERIZATION. D. W. Young (to Standard Oil) U.S. 2,603,665, July 15. Polymerization of ethylene in the presence of aluminum chloride-methyl chloride solution.

ARTIFICIAL EYE. F. W. Jardon and R. W. Bennett (to American Optical). U.S. 2,603,791-2, July 22. Plastic artificial eyes.

FILM. R. D. Lowry and H. L. Schaefer (to Dow). U.S. 2,603,838, July 22. Preshrinking crystalline vinylidene chloride copolymer film.

CELLULOSE SULFATE. J. R. Caldwell (to Eastman Kodak). U.S. 2,603,839, July 22. Filaments of metal salts of cellulose sulfate.

MOLDING POWDER. H. Dreyfus (to Celanese). U.S. 2,604,412, July 22. Cellulose ether molding powder.

ETHYL CELLULOSE. E. L. Kropscott and P. H. Lipke, Jr. (to Dow). U.S. 2,604,413, July 22. Ethyl cellulose plasticized with di-tertiary-octyl diphenyloxide.

CONTAINER. E. McK. Beekman (to U.S.). U.S. 2,604,426, July 22. Double wall container of resin-impregnated absorbent material.

BONDED FIBER. M. C. Armstrong and E. M. Lockhart (to Owens-Corning). U.S. 2,604,427, July 22. Glass fibers bonded with dicyandiamide-formaldehyde and phenolic resins.

COPOLYMERS. A. H. Popkin (to Standard Oil). U.S. 2,604,453, July 22. Copolymers of lauryl acrylate, and methyl acrylate.

POLYSTYRENE. R. Signer. U.S. 2,-604,456, July 22. Sulfonation of polystyrene.

COPOLYMERS. G. H. Segall and J. F. C. Dixon (to Canadian Industries). U.S. 2,604,457, July 22. Styrene-acrylic acid copolymers reacted with polymeric 4-vinylcyclohexene diepoxide.

VINYL COPOLYMERS. C. B. Havens (to Dow). U.S. 2,604,458, July 22. Stabilizing copolymers of vinyl chloride and vinylidene chloride with dihydric phenols or phosphorous acid salts.

VINYL RESINS. G. P. Mack (to Advance Solvents). U.S. 2,604,460, July 22. Polyvinyl chloride resin stabilized with organo-tin complex compounds.

RESINS. H. H. Roth (to Dow). U.S. 2,604,461, July 22. Sulfonated alkenyl aromatic resins.

VINYL COPOLYMERS. J. A. Bilton and G. H. Segall (to Canadian Industries). U.S. 2,604,463, July 22. Copolymer of glycidyl acrylate, acrylic acid, styrene, and methyl acrylate, cross-linkable when heated.

COPOLYMERS. G. H. Segall and J. F. C. Dixon (to Canadian Industries). U.S. 2,604,464, July 22. Reaction product of diphenylolpropane diglycidyl ether with styrene-acrylic acid copolymers.

ISOBUTYLENE. H. G. Schneider, D. W. Young, and H. G. Goering (to Standard Oil) U.S. 2,604,465, July 22. Selective copolymerization of isobutylene.

POLYMERIZATION. C. F. Fryling, J. E. Troyan, and J. E. Pritchard (to Phillips Petroleum). U.S. 2,604,466, July 22. Emulsion copolymerization of styrene with butadiene in the presence of a dioxane.

POLYMERIZATION. J. E. Underwood and A. Hill (to Diamond Alkali). U.S. 2,604,468, July 22. Chlorite-sulfite redox-initiated aqueous polymerization of vinyl chloride.

EXTRUSION. W. T. Eppler (to Western Electric). U.S. 2,604,659, July 29. Feeding apparatus for plastic extruders.

LIGHT POLARIZER. O. E. Schupp, Jr. (to Du Pont). U.S. 2,604,817, July 29. Light polarizing sheet comprising oriented bi-refringent fibers embedded in another plastic material.

SILOXANE RESINS. E. J. Smith (to Dow Corning). U.S. 2,605,194, July 29. Resin composed of methyl, phenyl, and methyl phenyl siloxanes.

OVERLAY. D. G. Patterson and W. F. Turner (to American Cyanamid). U.S. 2,605,205, July 29. Decorative laminate overlay of melamine resin and resinous fibers.

RESINS. F. J. Sowa. U.S. 2,605,243, July 29. Alkyd resin modified with an alkoxy hydrocarbon silane.

VINYLIDENE CHLORIDE. J. D. Matlack and R. J. Reid (to Firestone Tire and Rubber). U.S. 2,605,244, July 29. Vinylidene resins mixed with diphenyl ether, glicydyl phenyl ether, and barium ricinoleate.

ACRYLONITRILE. A. Cresswell and P. W. Cummings (to American Cyanamid). U.S. 2,605,246, July 29. Solutions of acrylonitrile polymer in aqueous salt solutions.

RESINS. E. C. Schule (to Firestone Tire and Rubber). U.S. 2,605,247, July 29. Artificial leather compositions of butadiene-acrylonitrile and polyvinyl chloride.

RESINS. C. F. Fisk (to U.S. Rubber). U.S. 2,605,248, July 29. Heat-curable mixtures of butadiene-acrylonitrile copolymers and phenol-aldehyde resins.

UREA RESINS. R. W. Auten and V. C. Mennier (to Rohm and Haas). U.S. 2,605,253, July 29. Urea resins having dimethylamino substituents.

VINYL CHLORIDE. R. J. Wolf (to B. F. Goodrich). U.S. 2,605,254, July 29. Vinyl chloride interpolymers containing free side-chain carboxyl groups.

COPOLYMERIZATION. W. R. Conard and C. E. Best (to Firestone). U.S. 2,605,256, July 29. Use of mercaptans in copolymerization of vinyl sulfides with acrylonitrile.

INTERPOLYMERS. R. J. Wolf and A. A. Nicolay (to B. F. Goodrich). U.S. 2,605,257, July 29. Interpolymers of vinyl chloride, alkyl acrylate, and styrene.

COPOLYMERS. H. S. Rothrock (to du Pont). U.S. 2,605,258, July 29. Copolymers of allyloxyethanol with acrylonitrile.

POLYVINYL ESTERS. L. M. Germain (to Shawinigan Chemicals). U.S. 2,605,259, July 29. Alcoholysis of polyvinyl esters.

SILOXANES. L. J. Tyler (to Dow Corning). U.S. 2,605,274, July 29. Organopolysiloxanes of 1,1,5,5-tetramethyl-3,3,7,7-tetra-*t*-butylcyclotetrasiloxane.

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CHEMICAL RESISTANCE to most acids, alkalis and other chemicals that eventually destroy metal parts and installations. Good for chemical pipe fittings, battery cases and various types of utensils that may be in contact with chemicals.

APPEARANCE, TOO! In colors with a distinctive glass fiber pattern showing faintly on the surface.

Flexfirm PRODUCTS

NEW MACHINERY AND EQUIPMENT

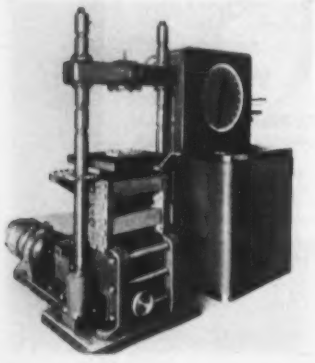
CENTERLESS GRINDING MACHINE—Designed exclusively for through feed centerless grinding, a new machine has been developed by the Engineering Laboratories, Inc., Pompton Lakes, N. J. The machine will centerless grind all of the plastics, including glass fiber rods. On the small diameters it will grind square rods into round rods.

The elimination of wheel dressing devices, which were incorporated into previous grinders of this type, makes this a much simpler machine to operate.

A grinding wheel 8 in. in diameter and 7 in. wide is used in the machine. The wheel can be easily removed by taking off the end splash cover and loosening a clamping nut. A fresh wheel can be substituted in less than ten minutes.

The machine is driven with a 5 hp. motor and can operate in some instances to a tolerance of as low as ± 0.0005 inches.

UNIVERSAL TESTING MACHINE—Incorporating an electric weighing system and an electronically-controlled,



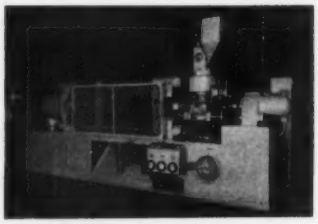
motor-driven loading mechanism, a universal testing machine is announced by Baldwin-Lima-Hamilton Corp., Philadelphia 42, Pa. The new Model FGT Baldwin-Emery SR-4 has a capacity of 50,000-lb. load. Advantages claimed for the tester include high speed response of indicator or recorder to dynamic, as well as static, loads; extreme structural stiffness and lateral rigidity; wide range of loading speeds under stepless control; and automatic load control for maintaining constant load, constant strain, constant rate of loading, or constant strain rate. Test loads are measured by means of two SK-4 universal load cells of 30,000-lb. capacity each and resistance wire strain gage instrumentation of the totalizing circuit type which provides instantaneous response.

The load system utilizes a single enclosed reversing screw rotated by a 2 hp. motor. Maximum stroke is 8 in.; the test table size is 20 in. square. Clearance between columns is 21 inches.

PUMPS AND POWER UNITS—A series of heavy duty air-hydraulic pumps and power units designed to develop high fluid pressure from low air pressure, has been developed by Ledeen Mfg. Co., 1000 San Pedro St., Los Angeles 15, Calif. These units, built as a complete package power unit, develop fluid pressure directly from plant air supply. Applications to which the units can be put include operation of high pressure cylinders, clamps, valves, actuators and hydraulic presses; safety installation and high pressure testing; special hydraulic circuits requiring variable and adjustable pressure and volume; and long pressure-holding cycles.

The pumps and power units are available in horizontal construction for minimum head room, and vertical construction for minimum floor space. Both pressure and volume are readily adjustable. Normal air pressure is suitable, and very little air is required.

INJECTION MOLDING MACHINE—A pre-plasticizing injection molding machine, which plasticizes the molding powder before it contacts the injection plunger, is being manufactured by the Hydraulic Press Mfg. Co., Mt. Gilead, Ohio. Specifications of the machine include a 48-oz. shot capacity; mold clamp capacity of 400 tons; daylight opening of 54 in.; 30-in. mold clamping stroke; and



large mold mounting space measuring 25½ by 36 or 40 by 21½ inches.

The Model 400-P-48 produces exceptionally deep parts up to 14 in. in depth and, with the quickly installed ram spacer, is suited for shallow parts.

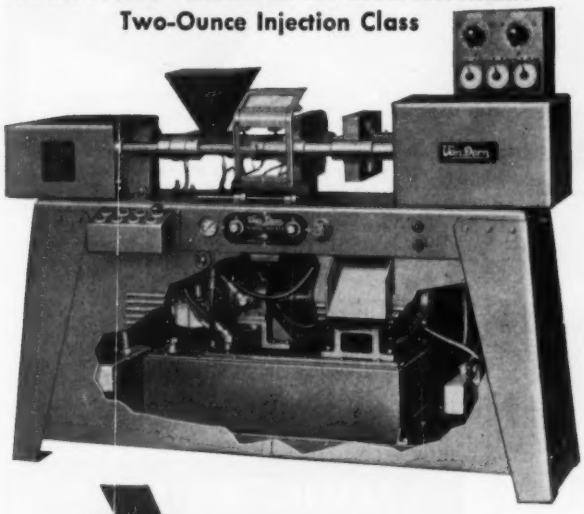
MIDGET PACKING GLAND—Designed as a standard seal for entry of small dial-type thermometers, thermocouple wells, pitot tubes, static pressure probes, round rods or tubes, a new midget packing gland has been announced by the Conax Corp., Buffalo 21, N. Y. As a tube seal the Conax may be used as a standard male connector for tube ends or as a standard compression fitting. In either application, the soft sealant used will not damage the tube.

The product is machined entirely from stainless steel cold drawn bar stock for maximum corrosion resistance, trouble-free operation, and interchangeability from one process to another. The seal is effected by compression of a packing material under a gland follower. This affords straight compression on the packing and avoids rotary slippage during assembly. The units are available from stock as a standard seal for small instrument tubes in sizes of 3/32, 1/8, and 3/16 in. in diameter. Intermediate diameters are available on special order.

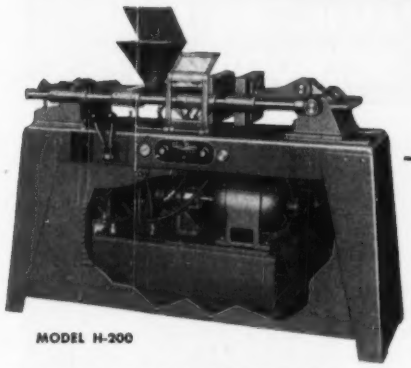
PHOTOELECTRIC CONTROL—Now being manufactured by Photoswitch, Inc., 77 Broadway, Cambridge 42, Mass., is a new general purpose industrial photo-electric control designed for general industrial and machinery application, and particularly recommended for such applica-

Produce Plastics Profitably With This
VAN DORN Equipment

Model H-200—Leader in the Semi-Automatic Two-Ounce Injection Class



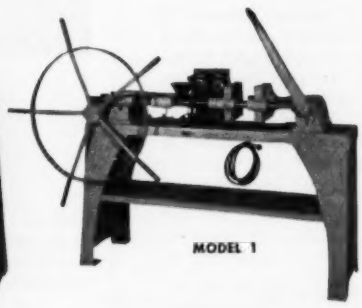
This ultra-modern press molds practically all thermoplastics including nylon. It completes up to 6 operating cycles per minute. Push button controls are safe, simple and convenient. Compact and rugged, the unit is quiet and economical in operation. Sliding gate with interlocking safety devices starts the cycle. Solenoid valves close the molds. Injection and dwell are controlled by first of three timers on the rear panel. Center timer regulates recharging of heater. The third timer controls the length of the mold close cycle; when time runs out, molds automatically open and parts are ejected. Operator opens safety gate, removes product and then closes gate to begin the next cycle . . . Variable voltage transformers in conjunction with thermostatic units control the temperatures on the two heating zones accurately.



MODEL H-200

Power Operated, Lever Controlled Presses

2-oz. or 1-oz. capacity. These low-cost units operate 8 hours for under a dollar and use inexpensive molds. Can easily be set up in twenty minutes by one man.



MODEL 1

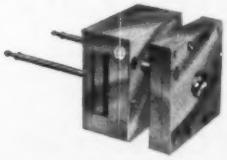
Manually Operated Press

1-oz. capacity. This press is ideal for smaller jobs, experimental work and technical training.

MODEL G-100

Plastic Grinder

Grinds up rejects, waste, etc., for re-use. Ruggedly made, designed for easy cleaning.



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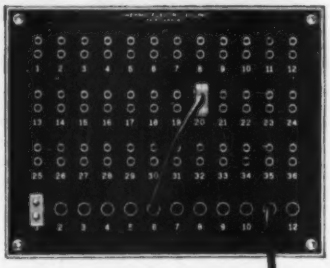
CONNECTING MANY THERMOCOUPLES?



Panel for 36 Thermocouples and 12 Pyrometer Connections.

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Use these Quick Coupling Connector Panels to provide centralized control and a rapid and flexible system for switching multiple thermocouple circuits. Polarized Plugs and Jacks of calibrated thermocouple material connect numerous thermocouples to pyrometers—regardless of their location.

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tions as counting, conveyer control, short-range signal systems, production inspection, machinery safeguards, as well as automatic control for hundreds of specialized industrial processes.

Specifications for the control include: supply—115 or 230 volts, 50/60 cycles; speed of operation—relay operations in 1/20 sec.; operating range—20 ft. max.; sensitivity adjustment—relay operation at any predetermined level of illumination within range of 10 to 50-ft. candles; relay—double-pole, single-throw; and contact rating—20 amps, 115 volts AC; 10 amps, 230 volts AC. Panel board terminals are provided for controlling operation of relay through external reset contacts.

COMPRESSORS—Designed to compress air entirely free of any trace of oil or oily vapor, a new line of compressors has been announced by the Pennsylvania Pump & Compressor Co., Easton, Pa. The compressor incorporates a steel-backed carbon cylinder-liner which obviates the necessity of a tailrod for the purpose of floating the piston. The burden of carrying the piston and piston-rod assembly within the air-cylinder is carried by the entire area of the liner upon which the piston and metallic rings run.

A long distance piece between the main frame and cylinder prevents any portion of the piston rod that enters the splash-lubricated main frame from alternately entering the air-cylinder stuffing box.

ALL-ELECTRIC STAKING MACHINE—Called "Electrostake," a new all-electric staking machine has been developed by Black & Webster, Inc., Newton, Mass. Basic improvement over conventional stakers consists of powering the machine by a solenoid rather than the spring loaded trip hammer used on most convention stakers. By reducing operator fatigue to a minimum, a 25 to 50% increase in production is possible. Both the hold-down pressure and the staking blow are fully adjustable.

A portable machine, the "Electrostake" suits any assembly-line operation where two or more assembled parts must be pressed firmly together and then staked or riveted with a sharp blow. Staking, riveting, eyeletting, upsetting, and rolling all can be accomplished.

An Introduction to

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The Hawley Products Company proudly announces the talented services of Jon W. Hauser, one of American Industry's most imaginative Designers.

His practical approach in combining the trends of modern design with the problems of Engineering, Production and Merchandising have long been recognized by Industry as successful achievements both in Industrial and Automotive design.

The services of Mr. Hauser, combined with the wondrous flexibility of the Hawley Molded Fibre and Glass Fibre low pressure molding, effects a combination of broad possibilities in practically any product of manufacture.

Consultation of your product problem will be given our prompt attention and fullest co-operation.

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BOOKS AND BOOKLETS

Write for these publications to the companies listed. Unless otherwise specified, they will be sent gratis to executives who request them on business stationery.

"Properties of the Principal Fats, Fatty Oils, Waxes, Fatty Acids, and Their Salts," by M. P. Doss.

Published in 1952 by The Texas Co., Technical and Research Div., 135 E. 42 St., New York 17, N. Y. 244 pages. Price $5.00.

Intended for those in the fatty oil, petroleum, and chemical industries, this volume covers the properties of approximately 50 of the principal fats, fatty oils, and waxes. More than 800 aliphatic acids are surveyed and tabulated as to properties. Data are given on the salts of the fatty acids ranging from aluminum through zirconium. Approximately 1750 salts are listed.

'An Introduction to the Chemistry of the Hydrides," by Dallas T. Hurd.

Published in 1952 by John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N.Y. 231 pages. Price $5.50.

Theory, properties, and reactions of the hydrides, together with a presentation of their preparation and industrial and research applications, are offered in this survey. Also covered are toxicology and the techniques of handling hydrides and hydride compounds.

"Styrene, its Polymers, Copolymers, and Derivatives," by R. H. Boundy and R. F. Boyer.

Published in 1952 by Reinhold Publishing Corp., 330 West 42 St., New York 18, N.Y. 1304 pages. Price $20.00.

Intended especially for industrial chemists engaged in the fabrication of polystyrene and in the handling of styrene for use in plastics, rubber, and resins, this book, No. 115 in the American Chemical Society Monograph series, is an account of the polymerization, copolymerization, chemical modification, and manufacture of styrene, and of its industrially important derivatives. Contained in the book is a history of styrene monomer and polymer dating back over a century, a summary of physical properties, methods of handling and analysis, and the chemistry of styrene. Also discussed are the physical behavior of polystyrene and its fabrication. An appendix covers such recent advances in the field as vinyltoluene, a monomer similar to styrene but using toluene rather than benzene as raw material.

"Technical Data on Plastics."

Published in 1952 by the Mfg. Chemists' Association, Inc., 246 Woodward Bldg., Washington 5, D.C. 183 pages. Price $2.50.

Designed to provide engineers and technicians with up-to-date information on properties of all commercially available plastics, this data book covers 24 types of plastics materials and includes sections showing the properties of various materials when made in the form of foams or thin films. A foreword for each material is followed by tables of property data on fabrication, miscellaneous tests, durability, electrical tests, and mechanical tests. For some materials there are also graphs supplementing the tables of property values.

This technical data book was erroneously reviewed in the October 1952 issue of MODERN PLASTICS, p. 160, as a current publication of the Plastic Materials Mfrs. Assoc., Inc. Actually, the first edition of the book was published by the PMMA in 1943. The volume reviewed above is a revised fourth edition and is issued by the Mfg. Chemists' Association, Inc., with which the PMMA has consolidated. The same member companies of PMMA, however, under the chairmanship of M. G. Milliken, Hercules Powder Co., Inc., have compiled and edited this present edition.

Files—The company's line of pattern files for industrial use is described and illustrated in this 6-page bulletin (No. 51-801). Included is information on the use and application of mill and saw files, machinists' files, rasps, and special purpose files. *The DoAll Co., Des Plaines, Ill.*

Styrofoam—Use of foamed styrene for low-temperature insulation is described and illustrated in this 24-page booklet. In addition to listing the properties of Styrofoam, the booklet describes several methods for installing the material on various surfaces and the application of adhesives and finishes. Data are also given on several low-temperature applications, including insulated vehicles, refrigerated equipment, and other industrial uses. *The Dow Chemical Co., Plastics Dept., Midland, Mich.*

Industrial catalog—Descriptions of 50 standard grades of Formica laminated plastics for industrial use are furnished in this 16-page catalog. Also included is a new edition of the company's comparator chart describing major characteristics of each grade, and a quantitative grading system which facilitates selection of the material best suited for special requirements. In addition, a folder describes "age-proof woods" for cutlery handles, parts for power and textile industries, and for use in sheet metal forming dies and drill jigs. *The Formica Co., 4614 Spring Grove Ave., Cincinnati 32, Ohio.*

Process industries' equipment—Equipment for such chemical unit operations as fluid flow, air-gas handling, pyro-processing, washing, and materials handling, as well as process plant electrical apparatus and mechanical transmission equipment, is described in this 24-page booklet. Products covered include centrifugal pumps; centrifugal blowers; axial compressors; crusher, grinding and flaking mills; and rotary kilns. The booklet also describes the company's research laboratory for investigating problems that arise in processing industries. *Allis-Chalmers Mfg. Co., 1163 S. 70 St., Milwaukee, Wis.*

Motion picture technique—Designed for businessmen contemplating a motion picture film project for sales promotion, advertising, or personnel training, this 54-page book discusses in non-technical terms the planning and production problems involved in film-making. Such problems include writing the story, filming, editing, and releasing. Special attention is given to the cost factor behind each step in the operation. Also included is a glossary of trade terms. The book is available for $1.00

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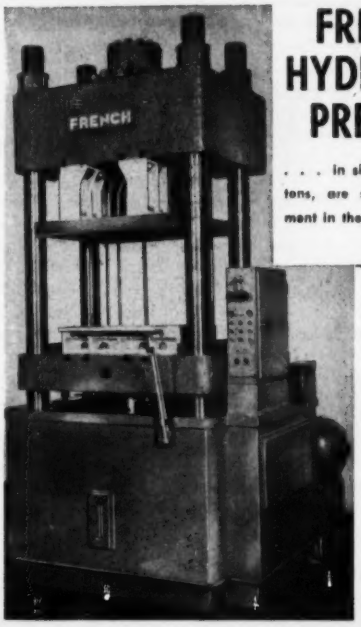

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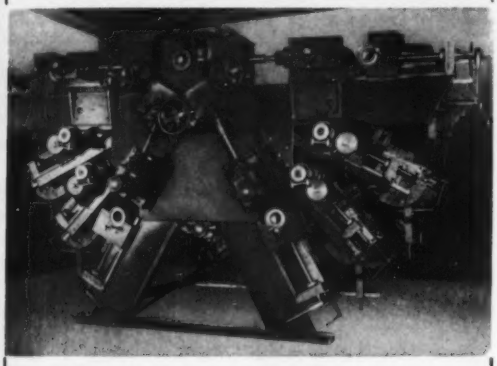

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Dry blending—Various dry blending techniques applicable to the company's Opalon 300 polyvinyl chloride resin are covered in this 19-page booklet (No. 79). In addition to outlining dry blending procedures, the booklet describes methods of formulating, coloring, and extruding the dry blends. A list of equipment manufacturers is included. *Monsanto Chemical Co., Plastics Div., Springfield, Mass.*

Chemical catalog—This revised 112-page edition of the company catalog covers basic chemicals for industry and agriculture. Included are tables of specific gravity, viscosity, specific heat, and solubility. *Stauffer Chemical Co., 420 Lexington Ave., New York 17, N. Y.*

Plastic floor tile—Advantages and features of Vinylflex plastic floor tile are described in this 2-color brochure. *Hachmeister-Inc., Pittsburgh 13, Pa.*

Carbon black pigments—Offered as an aid to the choosing of the particular carbon black pigment best suited for a particular application, this 16-page booklet gives technical information on the pigments in the company's line. Each of the pigments is described and a tabular treatment is given of its various properties. Among the black pigments covered are those for the plastics, the paint, the paper, and the ink industries. *Godfrey L. Cabot, Inc., Special Blacks Div., 77 Franklin St., Boston 10, Mass.*

Silicones—Over 20 different properties of the company's liquid methylsilicones, called 200 Fluids, are studied in this 31-page illustrated notebook. Included are a blending chart for intermediate viscosities and a list of current industrial applications. *Dow Corning Corp., Midland, Mich.*

Laboratory planning kit—Custom installations of entire laboratory rooms can be done without blueprints, conferences, etc., by using this laboratory planning kit. Contained in the kit are scaled cut-outs, representing 21 ready-made, pre-engineered steel furniture units. The cut-outs can be manipulated on the kit's graph paper to form any desired arrangement. Also included with the graph paper are front and side-view dimensional drawings, a catalog of unitized furniture, and photographs of suggested installations. *Fisher Scientific Co., 717 Forbes St., Pittsburgh 19, Pa.*

Processing machinery—Machinery designed and built for processing plastics, rubber, and other materials is described in this new 64-page illustrated catalog. The types of equipment discussed include Spiral-Flow intensive mixers, calenders, mills, hydraulic presses, pump units, and speed reducers. *Stewart Bolling & Co., Inc., 3190 East 65 St., Cleveland 27, Ohio.*

High-pressure pumps—Intended for use by design and plant engineers with high-pressure pumping problems, this 6-page illustrated bulletin (No. 12-295) presents facts and data on pumps from 600 to 5000 p.s.i. or 1.1 to 16.5 g.p.m. Included are descriptions of direct drive and back-geared models for such uses as

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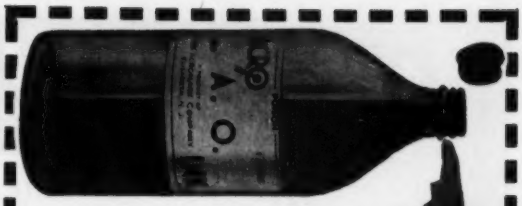

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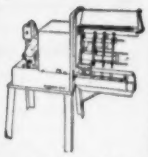

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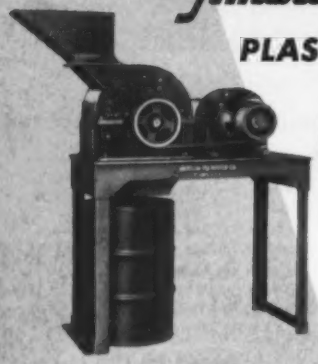

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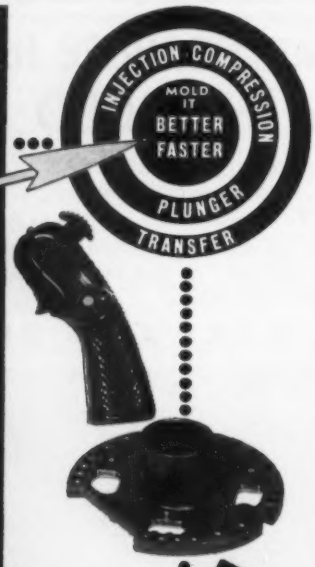

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high pressure testing, high pressure boiler feeding, and for hydraulic presses in baling, bending, shaping, forming, laminating, die casting, etc. *American-Marsh Pumps, Inc., Battle Creek, Mich.*

Plastics in the tropics—The results of exposing expanded plastics to various combinations of tropical conditions for a period of six months are discussed in a 17-page booklet. The physical deterioration of the materials was noted throughout the exposure period and the factors causing that deterioration are examined in this booklet. Price information is available from *Director, Prevention of Deterioration Center, National Research Council, 2101 Constitution Ave., Washington 25, D. C.*

Rubber-to-metal adhesive—Bonding rubber to metal by the use of an adhesive called Kalabond is described in this 7-page booklet. The adhesive's utilization in joining natural GRS, neoprene, and nitrile rubber compounds to iron, steel, stainless steel, aluminum, zinc, magnesium, brass, monel, and nickel is discussed and correlated in two test data charts. Also included in the booklet is information on the proper use of the adhesive. *General Tire & Rubber Co., Chemical Div., 1708 Englewood Ave., Akron 9, Ohio.*

Electrolimit height gage—A precision instrument designed to be used in gage inspection rooms, tool rooms, and workshops for comparing or transferring gage block-established dimensions and checking runout, squareness, and concentricity is described in this 4-page booklet. Photographs, a diagrammed cross-section drawing, and a list of specifications are also included for the machine. *Pratt & Whitney, West Hartford 1, Conn.*

Compressors—Vertical angle compressors and various accessories are illustrated and described in this 32-page bulletin. Information on the installation and operation of the compressors plus maintenance costs and construction specifications are presented in the booklet. Also included is a description of variable capacity control. *Worthington Corp., Harrison, N. J.*

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Coloring Lucite and Plexiglas—The technique and advantages of coloring acrylic are described in this 4-page folder. Separate data sheets are also available on specifications and prices for several of the company's color blends. *Ferro Corp., 4150 E. 56 St., Cleveland 5, Ohio.*

Liquid polymer—Properties and representative applications of Thiokol LP-2, a viscous liquid which converts to a tough, solvent-resistant rubber at normal working temperatures without shrinkage, are described in this illustrated brochure. *Thiokol Corp., Trenton 7, N. J.*

Testing machine—Characteristics of a testing machine with a 50,000 lb. capacity and having an electric weighing system based on a resistance wire strain gage, is offered in this 4-page pamphlet. Cross-sectioned diagrams of the tester are included. *Baldwin-Lima-Hamilton Corp., Philadelphia 42, Pa.*

Modified alkyd resin—Designed especially for high quality nitrocellulose furniture lacquers, Resin 50-5, an oil-modified alkyd resin, is described in this 4-page pamphlet. Outlined in the pamphlet are the material's specifications, performances under various climatic conditions, and suggested formulations. *American Cyanamid Co., Coating Resins Div., 30 Rockefeller Plaza, New York 20, N. Y.*

Sulfur bloom control—Incorporating insoluble sulfur into a wide range of rubber compounds by means of Ko-Blend I. S. is described in this illustrated pamphlet. Also explained is the use of the material, a latex-compounded masterbatch containing 50 parts of 85% insoluble sulfur co-precipitated with 50 parts of rubber of the GRS type, in light colored stocks to eliminate surface discoloration in finished products caused by sulfur bloom in the uncured state. *General Tire & Rubber Co., Chemical Div., 1708 Englewood Ave., Akron 9, Ohio.*

Polish technical abstracts—Available for use by those interested in current Polish trade information, a 159-page booklet presents abstracts and descriptions of articles which have appeared in technical publications in Poland. This present issue (No. 4) contains articles published in 1949, 1950, and 1951. Among the publications represented are *Chemical Industry, Wood Industry,* and *Petroleum. Glowny Instytut, Dokumentacji Naukowo-Technicznej, Warsaw, Poland.*

Impact-testing machine—Low-capacity impact testers, developed for making accurate standard tests of plastics and electrical insulating materials over a wide capacity range, are described and illustrated in this 4-page brochure. *Testing Machine Div., National Forge and Ordnance Co., Irvine, Warren Co., Warren, Pa.*

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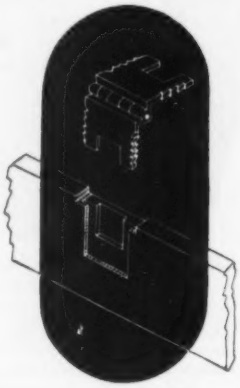

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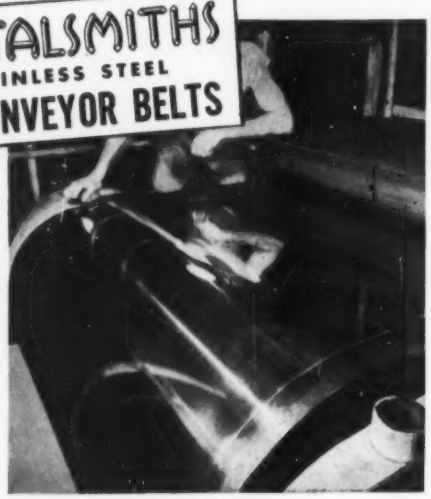

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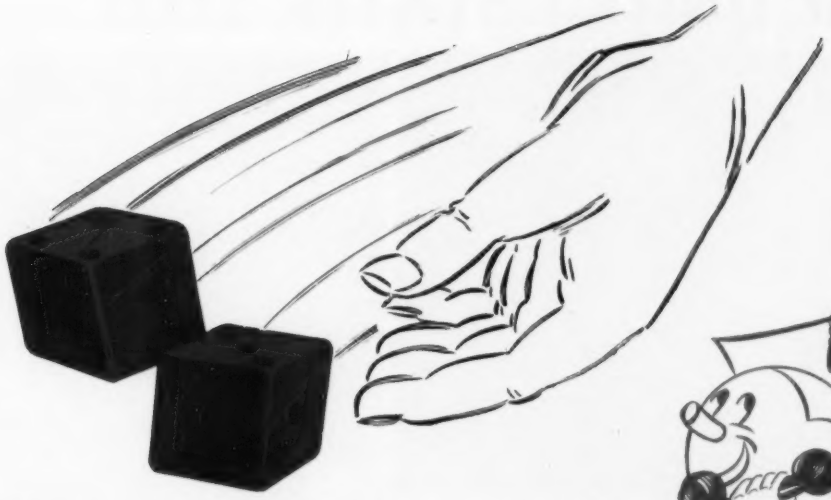
Control of dermatitis—Prevention and control of dermatitis, most common occupational disease, is the subject of this 32-page illustrated booklet. The booklet presents a program for setting up an employee's personal cleanliness schedule, for protection of exposed skin area, for preventing clothing contamination, and for safeguarding against special hazards. A 6-page chart, covering a wide range of industries, lists various working conditions, types of dermatitis prevalent where these conditions exist, and suggested preventive measures for each. The booklet describes various company products formulated to solve the special cleansing and sanitation problems of the industry. *West Disinfecting Co., 62-16 West St., Long Island City 1, N. Y.*

Injection molding machines—Information on the company's production of die-casting and injection molding machines is given in this 4-page quarterly newsletter. Included among the machines are a molding unit fitted with a new and simplified hydraulic circuit and a die-caster which has all its hydraulic equipment situated outside the machine to insure ease of maintenance. *Projectile & Engineering Co., Ltd., Acre St., Battersea, London S.W. 8, England.*

Alkyd-type resins—Information on the modification of alkyd-type resins with styrene has been made available in this 14-page technical data report. It is offered as a general guide to manufacturers who are interested in developing their own styrene modified alkyds for particular uses. Charts and tables supplement



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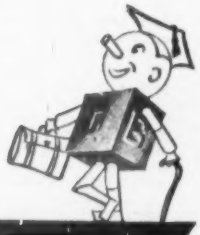

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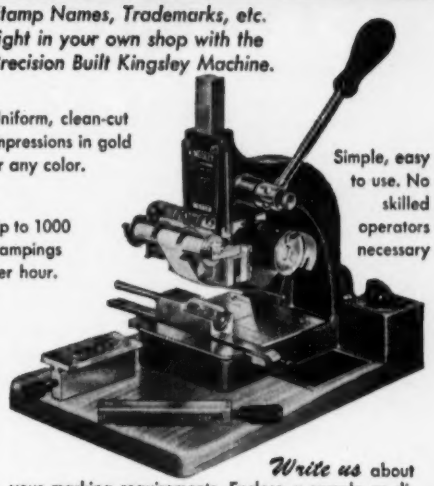

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the text, which deals with such topics as the products made by direct styrenation of an alkyd, the effect of variables in alkyd manufacture on styrenation, effect of ratio of carboxyl to hydroxyl content in alkyd, and the effect of variables in the styrenation on conversion rate and on product characteristics. *Monsanto Chemical Co., Development Dept., Texas Div., Texas City, Texas.*

Bakelite and Vinylite—Properties and uses of more than 50 Bakelite and Vinylite plastics and resins are described and illustrated in this revised reference file. The 16-page 1953 edition contains 110 photographs showing applications and finished products. Short descriptions of the wide range of special and general-purpose Bakelite phenolic, styrene, and polyethylene and of Vinylite plastics and resins are presented in 22 categories under eight major headings: 1) molding and extrusion materials; 2) protective coating resins; 3) rigid sheets; 4) flexible film and sheeting; 5) wire and cable insulation; 6) calendering materials; 7) laminating, bonding, adhesive resins; 8) packing materials. *Bakelite Co., Div. of Union Carbide and Carbon Corp., 300 Madison Ave., New York 17, N. Y.*

Spray dryers—A question-and-answer presentation as to performance and price of the company's line of spray dryers is found in this 8-page booklet, entitled "Zizinia Packaged Unit Spray Dryers." Typical of the products now being dried by this equipment are powdered soaps and soap powders, synthetic detergents, pharmaceuticals, and powdered forms of sugar, coffee, milk, eggs, and blood. *Foster D. Snell, Inc., 29 West 15 St., New York 11, N. Y.*

Vinylite resin—Recent information on the properties and uses of Vinylite resin VAGH is offered in a revised booklet, "Vinylite Resins—Technical Release No. 6," intended especially for use by the paint and industrial coatings manufacturers. *Bakelite Co., Div. of Union Carbide and Carbon Corp., 300 Madison Ave., New York 17, N. Y.*

Products and services—The third edition of an illustrated catalog on products and services for industry and agriculture contains a listing and description of each. It also outlines the divisional structure through which such products are sold. *American Cyanamid Co., 30 Rockefeller Plaza, New York 20, N. Y.*

Precision machines—Detailed information on the company's line of Di-Archo precision machines for dieless duplicating is offered in this 32-page catalog. The machines are illustrated and explained as to construction features, specifications and capacities. Included are Di-Archo power equipment for high speed dieless duplicating, benders, rod parter, power parter, punch presses, and brakes. *O'Neil-Irwin Mfg. Co., Lake City, Mich.*

Business survey—A 32-page study, "Commercial Failures in an Era of Business Progress: 1900-1952," it traces the growth of America from the turn of the century and analyzes the effects of the events of the day on the success or failures of business. Included is a 4-page survey of business expectations for the fourth quarter of 1952. *Dun & Bradstreet, Inc., 99 Church St., New York 8, N.Y.*

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Mixers: Plain or Stainless
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Production of

FOR the purpose of this report, production is the sum of the quantities of materials produced for consumption in the producing plant for transfer to other plants

PLASTICS AND SYNTHETIC RESIN PRODUCTS From Purchased Chemicals

Materials	*Total p'd'n. first 7 mos. 1952*	*Total sales first 7 mos. 1952*
CELLULOSE PLASTICS:[a]		
Cellulose acetate and mixed ester plastics:		
Sheets, under 0.003 gage	5,904,836	5,796,853
0.003 gage and over	5,056,650	4,965,072
All other sheets, rods, and tubes	3,155,618	2,943,264
Molding, extrusion materials	30,216,631	29,950,609
Nitrocellulose:		
Sheets	2,889,632	2,498,702
Rods and tubes	460,409	541,769
Other cellulose plastics[b]	4,492,281	4,101,019
PHENOLIC AND OTHER TAR ACID RESINS:		
Laminating	35,536,255	23,414,958
Adhesive	22,760,916	21,219,557
Molding and casting materials[a]	89,433,074	76,770,147
Protective coatings, modified and unmodified except by rosin)	15,141,359	13,122,351
Miscellaneous uses	33,861,527	31,185,602
UREA AND MELAMINE RESINS		
Adhesives	43,105,584	43,056,969
Textile-treating resins	18,067,091	17,325,864
Paper-treating resins	12,279,283	12,000,769
Protective coatings, modified and unmodified	12,277,092	9,733,677
Miscellaneous uses, including laminating and molding[c]	28,623,267	31,931,912
STYRENE RESINS:		
Molding materials[a]	142,561,384	116,604,796
Protective coatings, modified and unmodified	37,500,806	39,541,223
Miscellaneous uses	38,957,232	32,385,292
VINYL RESINS:[d] Total	247,983,313	216,821,619
Sheeting and film (resin content)[e]		86,870,278
Adhesives (resin content)		8,797,855
Textile and paper-treating resins (resin content)[f]		22,886,494
Molding and extrusion materials (resin content)		74,052,329
Protective coatings (resin content)		10,571,021
Miscellaneous uses (resin content)		15,643,642
COUMARONE-INDENE AND PETROLEUM POLYMER RESINS:	99,431,268	99,527,204
MISCELLANEOUS SYNTHETIC PLASTICS AND RESIN MATERIALS:		
Molding materials[a, c]	57,584,348	54,461,807
Protective coatings[h]	32,143,772	32,258,371
All other uses[i]	54,321,689	53,581,587

[a] Dry basis is designated unless otherwise specified. [b] Includes fillers, plasticizers, and extenders. [c] Includes sheets, rods, and tubes, and molding and extrusion materials. [d] Data on resins for laminating and miscellaneous uses are on a dry basis; data on molding materials are on the basis of total weight. [e] Production statistics by uses are not representative, as end-use may not be known at the time of manufacture. Therefore, only statistics on total produc-

Plastics Materials

of the same company, and for sale. Sales include only the quantities involved in bona fide sales in w'ich title passes to the purchaser.

June 1952		July 1952	
Production	*Sales*	*Production*	*Sales*
649,152	683,469	820,555	825,871
654,469	688,778	791,727	725,806
409,602	388,239	401,047	363,750
3,804,780	3,934,311	4,503,623	4,486,010
382,540	322,048	299,203	257,674
70,789	84,637	77,567	83,452
399,624	484,420	442,351	353,614
5,198,199	3,268,735	4,604,189	2,964,623
3,130,435	2,971,323	3,560,654	3,307,616
11,314,546	9,402,965	8,923,067	8,281,272
2,016,411	1,720,541	2,064,933	1,666,355
5,183,399	4,895,114	3,893,320	3,538,447
6,797,825	6,255,528	5,053,779	5,565,689
2,462,865	2,069,814	1,905,879	2,165,531
2,078,813	1,704,897	1,639,979	1,813,975
1,924,459	1,404,933	1,646,261	1,118,006
3,972,322	4,484,143	2,589,118	4,132,347
20,532,164	16,513,415	19,684,408	16,383,113
6,012,788	6,238,292	6,500,815	6,220,768
5,880,919	4,874,753	6,630,539	5,728,294
29,357,245	27,204,766	28,755,572	27,238,795
	10,015,354		10,503,657
	1,378,865		1,425,110
	3,302,987		2,980,205
	8,739,042		8,298,218
	1,594,180		1,736,151
	2,174,338		2,295,454
13,538,371	13,473,890	14,161,997	14,219,319
8,299,665	6,832,121	7,784,127	6,484,928
2,265,281	2,303,653	1,469,050	1,861,859
9,166,965	8,197,176	6,583,952	7,645,585

tion are given. [a] Prior to January 1951, statistics were given on the basis of total weight. [c] Includes data for spreader and calendering-type resins. [e] Includes data for acrylic, polyethylene, nylon, and others. [b] Includes data for epichlorohydrin, acrylic, polyester, silicone, and other protective coating resins. [d] Includes data for acrylic, rosin modifications, nylon, silicone, and other plastics and resins for miscellaneous uses.

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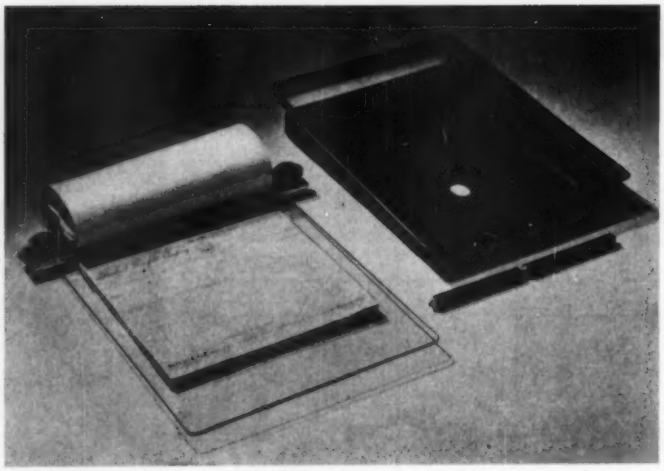

Transparent acrylic writing surface (left) is supported on the top ledge of the tray-like base (right) of new office form writer; base is formed of durable copolymer sheet

Formed Sheet in Form Writer

FORMED trays of 3/32-in. copolymer sheet material have been advantageously combined with transparent acrylic sheet in a new office device which expedites the preparation of multiple handwritten copies of shipping orders, bills of lading, and other business forms. Made by Standard Manifold Co., Chicago, Ill., the Stamco Handi-Riter is used with continuous fandoll forms incorporating re-usable sheets of carbon copies. It is capable of making as many as ten carbon copies of handwritten orders, thus eliminating the need for re-typing or machine copying.

Weighing just over 1½ lb., the compact Handi-Riter, which costs about one-third as much as conventional type registers, requires little space on desk or counter and may be easily carried about.

The exceptionally durable tray-like base of the unit is formed of dark green Morocco grain Royalite copolymer sheet by Arrem Plastics, Chicago, Ill., using the plug and ring technique. It is designed with a top ledge which supports the transparent writing surface of ⅛ in. Plexiglas acrylic sheet. The manufacturer inserts 4 rubber feet in the bottom of the tray, cuts a paper feed slot in the front edge, and applies two metal snaps which hold the idling roller in position. The guides supporting the carbons in proper alignment with the folded forms are mounted directly on the writing surface.

In addition to light weight, durability, and smooth surface, the acrylic plate permits observation of the remaining supply of forms by simply lifting up the sheets. The folded forms, which feed from the bottom tray via the slots and form guides, are torn off along perforations when filled out, bringing a new set of forms into position. If desired, a master stencil may be made simultaneously on the unit and multiple copies run off on a spirit-type duplicator.

Office writing device expedites preparation of multiple handwritten copies

Plastics Pioneers

A UNIQUE experiment in documenting the historical highlights of the plastics industry was a feature of the three-day meeting of the Plastics Pioneers Association, held Sept. 18-20, at the Shawnee Inn, Shawnee, Pa.

The membership of the organization, which was founded just 15 years ago, consists of original pioneers and men of accomplishment in the plastics field, and, as such, was ideally suited for the planned documentation by tape recording of each member's actual participation in the industry's growth. As the start of this series, some twenty-three members attending the meeting recorded in their own voices the background and history of important developments with which they were personally associated. Arnold Pitcher, formerly of the Du Pont Co., was moderator on the recordings.

Alan S. Cole

Arnold Pitcher

When the recordings are complete, the organization plans their use as background material to prepare a written historical record.

The meeting concluded on Saturday night with a dinner for members and their wives, at which a testimonial plaque was presented to M. M. Makeever, the oldest member in the organization's roster.

Hans Wanders

Officers for the association's new year beginning May 1953, will be Alan S. Cole, MODERN PLASTICS, president; Arnold Pitcher, vice president; Hans Wanders, Northern Industrial Chemical Co., secretary-treasurer.

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SPECIAL 5-FLUTED TAP FOR PLASTICS

NOW AVAILABLE AT STANDARD PRICES

5TH FLUTE
TAPS 5-TIMES MORE

Nothing beats this new Hy-Pro tap in threading brittle phenolics and thermo-plastics. Especially designed for plastics, the cutting face, flute form and narrow lands dissipate heat, prevent hole shrinkage and lengthen tool life. The fifth flute provides a fifth cutting face at no extra cost to the user. Available from stock in both plug and bottoming types. Four sizes: 6-32; 8-32; 10-24; 10-32, with Pitch diameter +.0025 over basic. These taps are available at standard prices with Hy-Pro's exclusive Hardernell surface treatment. Write for our standard price bulletin which gives complete information. Send for it today.

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Plunger
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To them this means we always consider their molding assignments in terms of *what is best,* not in terms of *what equipment we have* . . . because we have every type of press equipment for molding plastics . . . the *one* molder in New England who offers you *all five major molding methods.*

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Molders of Plastics for over a Quarter Century

Bubble Lamps

FASHIONED of hard-drawn steel wire and translucent white vinyl, a fanciful series of "Bubble" lamps, manufactured by the Howard Miller Clock Co., Zeeland, Mich., present a dramatic and decorative source of soft light.

Although available in a wide range of shapes and sizes, the lamps all possess the same bubble-like characteristics, enhanced by the repetitive linear pattern produced by the cage-like understructure seen through the translucent vinyl sheath. This understructure consists of 24 to 48 ribs of hard-drawn steel wire, each bent in an identical manner in accordance with the shape that is desired. Over these cages, a vinyl in a liquid state is sprayed. The vinyl, on drying, coagulates into a tight fitting and translucent white sheath.

The light-diffusing qualities of the vinyl are so excellent that any of the lamps will take up to a 300-watt bulb whenever any brighter lighting is desired. A light bulb of any color will impart the same hue to the entire surface of the lamp.

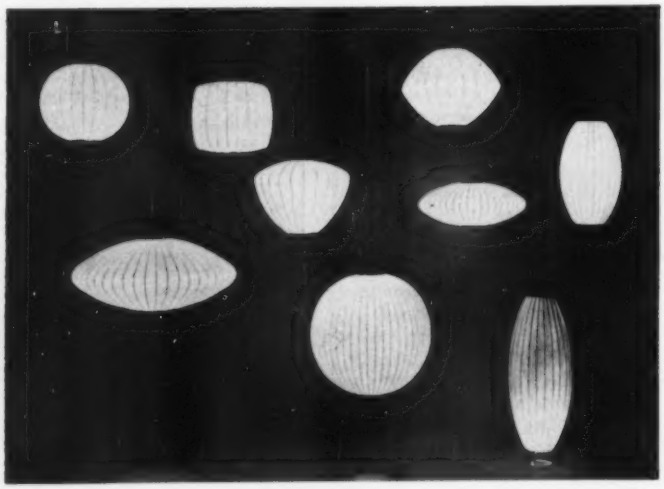
The vinyl skin, in addition, is firm and resilient to the touch, and may easily be wiped clean with a damp cloth. In combination with the design of the lamp, which provides top and bottom openings for carrying off air heated by the light bulb, the vinyl's non-combustible qualities lend an important safety feature to the unit.

The two openings serve both a decorative and functional purpose. Each opening carries a chrome-finished steel bezel which serves as a base for a three-pointed "spider" attachment and the lamp's various mechanical fastening devices.

Also available with the lamps are a series of accessories for converting the units into any one of three different types. Included are a ceiling pulley and spring reel for use when the lamps are to be employed as a hanging ceiling fixture; a wall bracket with inserted swing arm for converting the lamp into a wall pin-up; and a tripod base that transforms it into a floor-standing lamp.

The lamps are available in six different shapes and nine different models, which include an elongated drum-like form, 21 in. high and 13 in. in diameter; a wide, flat gourd shape, 9½ in. high and 25 in. in diameter; a marshmallow shape, 17 in. in diameter, and 15 in. high; a bubble shape with a sharp central bend, 21 in. in diameter, and 16 in. high; and a large, perfect sphere, 20 in. in diameter and 16 in. high.

A series of attractively designed "bubble" lamps consist of hard-drawn steel wire, covered with a tough and resilient skin formed by a translucent white vinyl sheath



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STERLING SPEED-TROL!

Mr. W. J. Johnson, President of Modern Plastic Machinery Corp., leading manufacturer of plastic processing equipment, states that highly versatile, dependable Speed-Trols increased production due to wide speed range, less maintenance and down-time; reduced rejects and improved quality because of accurate, positive speed regulation; saved 20% floor space because of compactness.

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With Speed-Trol you get the maximum in production, plant efficiency, quality and profit

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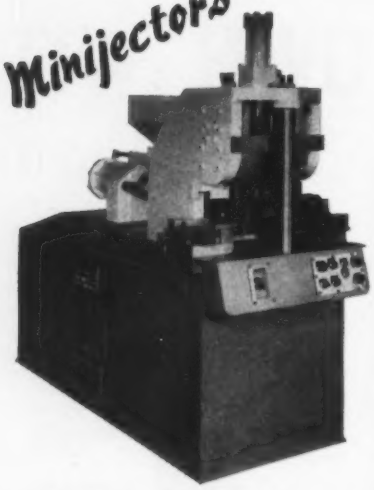

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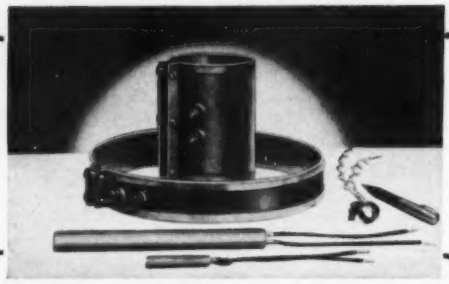

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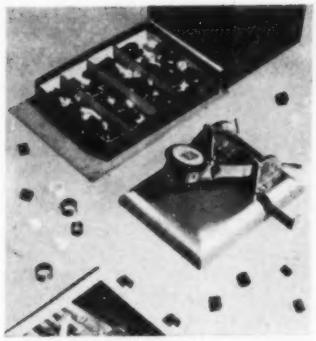

Vinyl tubes, used in binding books, are automatically locked into position

Midget Punch Kit

BOOKBINDING by hand can be cheaply and easily done with a Midget Punch Kit, manufactured by Tauber Plastics, New York, N.Y. Albums, themes, reports, or blueprints can be plastic-bound for less than two cents a book.

The kit consists of an easy-to-use hand punch and 150 Tauber crack-resistant vinyl plastic binding tubes in red, white, blue, and crystal. Sizes of binding tubes range from $\frac{3}{16}$ in. to one inch.

The operation of the punch kit is simple. The cover and then papers or prints are placed in order and punched as desired with the hand punch. The holed paper is then lined up and the vinyl tubes are inserted and locked automatically. A touch of the finger will unlock the tubes if future insertions are necessary.

The all-metal punch measures 6 by 4½ by 3½ in. and is mounted on a grey-finished wood base. Easily adjustable side and rear paper margin regulators facilitate the use of the punch, which is adjusted to hair-spring accuracy. The entire kit is boxed in an attractive carton with individual compartments for the assorted vinyl binding tubes.

The finished book has free-turning pages and can be opened flat to give a full-page view. The use of the vinyl binding tubes allow for either a permanent or loose-leaf book.

The manufacturer claims that the kit may be used to make plastics handicraft items.

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Starting with TEFLON*, United States Gasket Company engineers have developed a series of "Filled" Fluorocarbon materials, greatly broadening the scope of usefulness of this wonder-plastic. For example, United States Gasket Company "Application Engineering" has already helped solve such material problems as long-wearing chemical resistant bearings and pump impellers; valve and pump packings, expansion joints and chambers, gaskets; the metal plating of Teflon; the hermetic sealing of electronic components; soldering and cementing to Teflon; etc., etc.

If you have a special materials problem, that one of these Teflon "alloys" might solve, tell us about it. Our engineering department will work with yours to determine the Chemelec Mixture best suited to your requirements.

UNITED STATES GASKET COMPANY

FLUOROCARBON PRODUCTS DIVISION
FABRICATORS OF "TEFLON" "KEL-F" AND OTHER FLUOROCARBON PLASTICS
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*duPont's trademark for its tetrafluoroethylene resin.

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PIONEERS OF MASS-PRODUCED METALIZING

Metallizing has turned this plastic toilet set into a best-seller, typical of the fine effects achieved by Metaplast.

Everything we touch turns to silver . . .

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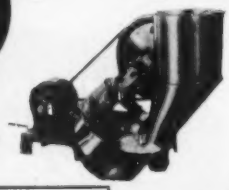


ButtOndeX CORP. 386 Fourth Avenue New York, N. Y.

Your Problem is Our Product

Silicone Sealed Switch

OUTSTANDING feature of the "sine curve" waterproof switch manufactured by Control Products, Inc., Harrison, N. J., is the enclosure of the basic switch in a silicone boot which completely seals the switch from moisture and dirt, as well as making it explosion proof and waterproof.

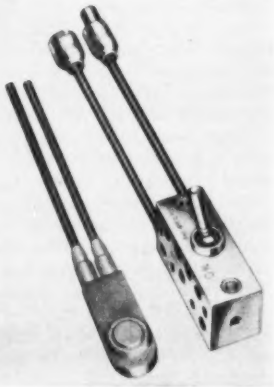
The boot is preformed as a separate operation. When ready for final closing, the boot is inserted over the switch and additional silicone is placed around the end where the wires are located. The switch is placed in a heat mold and closed under pressure.

The silicone-covered switch is then placed in a metal housing with actuating mechanism to form a completed unit.

The ability of the switch to resist shock is due to a radically different configuration. The contact is in the middle of two supported ends of the over-center mechanism. This so-called sine curve mechanism is stressed longitudinally, which causes the two loops of the sine curve to form themselves into opposite helixes.

The waterproof switch can be made up in many styles, including single pole-single throw or double pole-double throw toggle and push button types of mechanisms.

Switch mechanism (left) is enclosed in a waterproof silicone boot and then placed in a housing (right) containing a toggle



Self-sealing cover of styrene freezer jar has molded-in lugs that interlock

Freezer Jar

AN all-purpose container for use in refrigerators and freezers is molded of clear, rigid polystyrene by the Tri-State Plastic Molding Co., Inc., Henderson, Ky. The jar is designed to hold either liquids, semi-liquids, or solid foods and will receive them in hot or cold form without any danger of warping, cracking, or deteriorating in any way.

Both the self-sealing lid of the jar and the rim of the jar itself are molded with a series of wedge-shaped lugs. When the lid is placed on the jar and slightly twisted, these opposing sets of lugs sandwich together to provide a positive locking action. While the unit is thus closed, a poured-in fused rubber gasket around the upper inside edge of the lid assures an airtight, leakproof seal that protects the contents of the jar. A twist of the wrist in the opposite direction will remove the lid.

The jar is molded with a slight tapering at its base to allow it to be stacked more securely and to facilitate its compact storage in refrigerator or freezer.

The jar can be washed in hot water and will not transmit the tastes or odors of any of the foods that it might hold. It is available in two sizes—a 1-qt. capacity jar measuring 3¾ in. in diameter and 5½ in. deep and a 1½-qt. capacity jar measuring 4¾ in. in diameter and 5½ in. deep.

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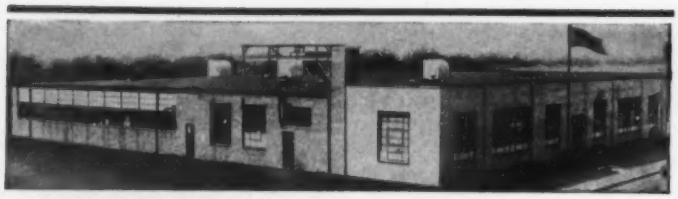

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Our new modern plant and added facilities are now at your disposal to satisfy all your plastics mold requirements.

We supply complete engineering coverage on INJECTION, COMPRESSION, TRANSFER, PLUNGER and LOW PRESSURE polyester applications.

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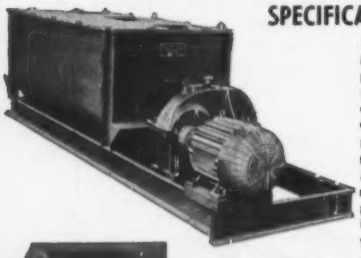
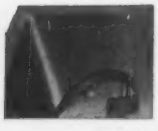


THE BAILEY MIXER ELIMINATES SOLIDIFYING ON HOT SURFACES! Now—you can pre-mix before loading into your banbury or calender—shortening cycle time—increasing production and boosting efficiency all along the line.

Here is up-to-the-minute construction with the very latest improvements in details. More efficient cleaning—empties quicker—more thoroughly—more basic body support—new mixing element—increased mixing intensity.

Write now for full details and the many reasons why such companies as Monsanto, American Cyanamid, Borden, Ross & Roberts, Resiloid, Ideal Plastics, Armstrong Rubber, and others—all use Bailey Mixers! We have a complete line of scrap preparation equipment including sifters, cutters, shredders, batch dumpers, and others.



ROUNDED CORNERS for quicker—more complete cleaning to assure pure dyes every time!

R. N. BAILEY CO., INC. 11 W. 42nd St. New York 18, N. Y.

Christmas Canes

AS a Christmas holiday decoration for trees or packages, Schwab & Frank, Detroit, Mich., is extruding a line of candy-striped Christmas canes made from cellulose acetate tube and solid rod. Frank Paper Products Corp., Detroit, Mich., is distributing the canes which can be colorfully used to create an appealing effect in highlighting the Christmas tree or brightening the Christmas corsages. Used for package tie purposes, the canes can be decorated with ribbon to lend a festive air to Christmas presents and decorative wrappings.

The smaller sized canes, of the seven sizes available, are extruded in red and white cellulose acetate, while the larger ones are ribbon-wrapped and hollow. Each is similarly colored with a white background and a red stripe that spirals the length of the cane. Transparent cellulose acetate is used for some of the canes intended for packaging purposes; the others can be had in the opaque white and two-tone red and white.

The smallest cane is sold in bulk form and also in a handy package of ten.

The canes are lightweight, easy to handle, and washable. At the same time, they are strong enough to withstand the rough usage that Christmas packages are apt to undergo.

The seven sizes in which the canes are available are 4¼ by $\frac{3}{16}$ in. in diameter; 6 by ¼ in.; 7¼ by ¼ in.; 10½ by $\frac{3}{8}$ in.; 14 by $\frac{5}{8}$ in.; 24 by ¼ in.; and 28 by 1 inch.

Christmas canes, for holiday decoration, are extruded of cellulose acetate

Flexible cast becomes rigid, retains its molded shape, and thus immobilizes patient after vacuum is produced by pump

Flexible Cast

STYRENE—widely used in molded form in the kitchen and playroom—has been drafted for hospital work by radiotherapists who are using a thin walled rubber bag filled with fine-grained styrene granules to immobilize patients during x-ray treatment. Called Flexi-Cast, the unusual device is manufactured by Dewey & Almy Chemical Co., Cambridge, Mass.

Application of the flexible cast is a simple procedure. The bag is manipulated to fit closely around any part of the body. Then a vacuum pump, which is attached to the bag by a rubber tube, is turned on and the air withdrawn from the bag. When a high vacuum has been formed (and the styrene pellets are subject to full atmospheric pressure and to the containing pressure of the walls of the bag which prevent dilation of the granular mass), the bag becomes rigid without losing the shape to which it was formed. Although the patient feels no pressure or discomfort, the contained part of the body is completely immobilized until the vacuum is released. When only part of the air is withdrawn, the bag can be molded like putty.

Choice of styrene for the granules was based on the interesting fact that its unit density is close to that of the human body; thus, x-rays pass through the bag with the same intensity as that calculated for therapy treatment.

Flexi-Cast can also be similarly used to make negative molds for plaster casts.

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IT'S ALMOST AS SIMPLE AS THAT—AND WITH

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YOU SAVE MONEY TOO—

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Write us about your problems and send for additional information on how to cut costs and increase the sales appeal of your plastic products.

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Custom Compounders of Thermoplastic Materials

THE NEW LIGHT-WEIGHT LOW-COST CHAMPION
of centerless grinders for plastics

Because it is a simple machine, designed exclusively for plastics, this light-weight through feed centerless grinder outperforms all previous grinders and sells for a much lower price.

simple to operate compact highest production
fine finish close tolerance

For example: 3/16" square hard vulcanized fibre rod is ground to round rod at 45 feet per minute, ±.002"; a second pass brings tolerance to ±.0005". Round phenolic rod, 1" diameter, is ground to ±.001" at 20 feet per minute.

We will gladly send full details on this remarkable centerless grinder, and estimate production speeds for your materials.

high-speed precision grinding of
VULCANIZED FIBRE
GLASS FIBRE ROD
CAST PHENOLIC
ALL OTHER PLASTICS

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FIND XALOY-LINED CYLINDERS
HARD TO BEAT!

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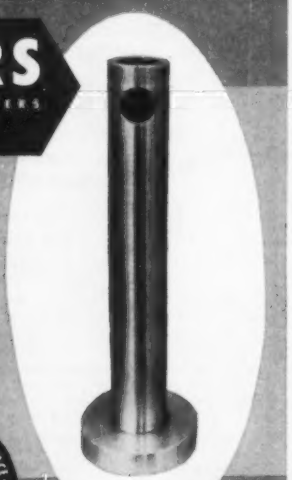
- Xaloy liners give longer service.



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Xaloy
NON-FERROUS ALLOY SURFACE WITH EXCEPTIONAL CORROSION RESISTANCE
Xaloy 306

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All-Vinyl Doll

WHAT is reported to be the first all-vinyl doll manufactured completely by the injection molding method, is molded by Hungerford Plastics, Inc., Rockaway, N.J., and distributed by Jay-Zee Doll Co., New York, N.Y.

The doll is made from Marvinol vinyl resin produced by Naugatuck Chemical Div., United States Rubber Co., Naugatuck, Conn. Development of the non-toxic vinyl compound and perfection of the injection molding technique which turns out heads, torsos, arms, and legs in fast production cycles is credited to Hungerford Plastics, Inc.

Sold under the trade name Vina Lee, the unbreakable doll has a "skin" that has a warm, life-like feel and has movable eyes. When squeezed, the doll emits a cooing sound. The doll contains no stuffing to be scattered about the house and can be washed repeatedly, which, according to the manufacturer, improves the vinyl "skin."

Assembly of the doll has been simplified so that when an arm or leg is pulled loose by the rough treatment accorded by a child, it can be put back on the body quickly and without tools.

Under-cut grooves on the arms and legs and corresponding sections on the torso of the doll permit easy assembly by the use of a metal ring to form a gasket between the torso and limbs. The joint is completely flexible and does not hamper movement of the doll's limbs—either arms or legs.

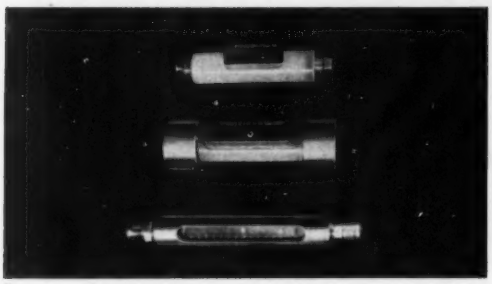
Limbs are easily assembled to torso of vinyl doll without using any tools

KEL-F

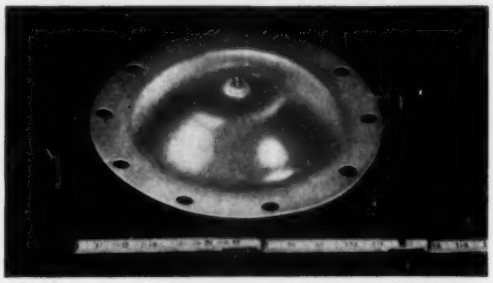
ONLY COMMERCIAL FLUORO-CHLORO-CARBON THERMOPLASTIC

Application Report #4

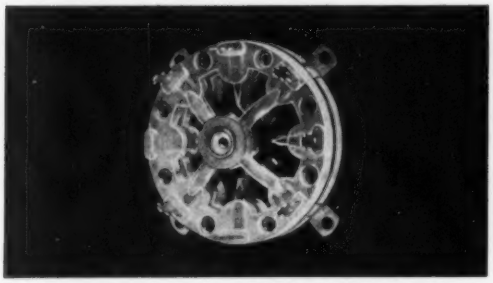
. . . how the unique thermoplastic — TRIFLUORO-CHLORO-ETHYLENE — has been used to solve tough design problems



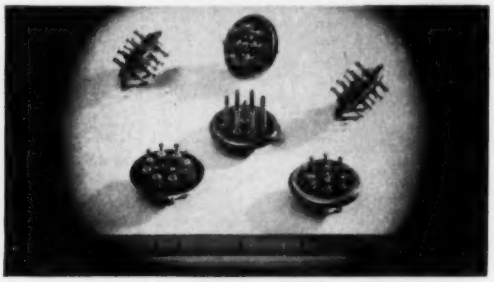
1. Glass won't do in these gauges which measure the rate of flow of hydrofluoric acid. Chemical inertness . . . transparency to permit reading liquid levels . . . shatter-resistance . . . and easy machinability of both rod and tube are the reasons for specification of Kel-F.



2. Superior flexibility over a wide temperature range, combined with chemical inertness, make Kel-F the natural specification for this large valve diaphragm to be used for corrosive service. Measuring *twelve* inches in diameter, the diaphragms are compression molded around metal inserts.



3. Mass production is possible with Kel-F because of its ready moldability. Electronic parts, like this tube base, may be injection molded in short cycles. No finishing, aside from sprue-removal, is required to assure close tolerance fits with metal parts.



4. A hermetical seal between insulation and contacts is required in these multi-lead terminals. Other major "specs" include superior electrical and heat resistance. Today, Kel-F is specified for such applications—because the seal is easily achieved through compression molding about metal contacts.

A Capsule Report on the Properties of KEL-F

- ★ Chemical Inertness
- ★ Wide temperature range —minus 320 F to 390 F
- ★ High electrical resistance
- ★ Low Cold Flow
- ★ Zero Moisture Absorption
- ★ Variable transparency and flexibility properties
- ★ Readily molded, extruded and machined

Basic Kel-F Products Available

MOLDING POWDERS

Unplasticized

#300 for high temperature service
#270 for less severe temperatures

Plasticized *(in either #300 or #270)*

P 20 with 20% plasticizer
P 25 " 25% "
P 30 " 30% "

DISPERSIONS

NW-25 flows readily at fusion temperatures
N-1 High molecular weight

OILS, WAXES and GREASES

#1 Light Oil
#3 Medium Oil
#10 Heavy Oil
#40 Waxy Oil (pour point 80-90 F)
#150 Hard Wax at 70 F
(Greases compounded to order)

Standard Fabricated Kel-F Materials and Parts Available from Commercial Sources

Molded Sheets ★ Extruded and Molded Rod ★ Extruded Tubing Thin Film (extruded as lay-flat tubing) ★ Strip Gaskets ★ Washers ★ Valve Discs ★ "U" Packing "O" Rings ★ Kel F coated Resilient-core "O" Rings Valve Diaphragms Transformer Terminals ★ Rotary Electric Switches ★ Hook-up Wire Electronic Terminals, Tube Bases and Coil Forms

For full information on various molders, extruders and fabricators of Kel-F products; also technical data on detailed properties, molding and application techniques — write

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WATERBURY COMPANIES, INC.
Waterbury, Conn.

Lightweight electric motor and acetate gearbox form a miniature power plant

Geared Motor

ONLY 1¼ in. high, a tiny electric motor fashioned to resemble its larger counterparts is the major component of a miniature electric power kit. Also included are a gearbox and gears, and an additional assortment of gears, shafts, and connector sleeves molded of Tennesse Eastman Tenite.

The kit is manufactured by Rowe Industries, Inc., Sag Harbor, N.Y., and distributed by Imperial Sales, New York, N.Y. Molding of the cellulose acetate housings and gears is done by Uneeda Sign Service, Brooklyn, N.Y.

Power for the motor is supplied by a battery pack containing two flashlight batteries which spin the motor at a speed of 3200 r.p.m. As many as four batteries may be used if an increase in the rate of power is desired.

For high speed operation, as in model planes and boats, the motor shaft may be connected directly to a propeller shaft by means of a connector sleeve. For other uses, such as in toy cranes and derricks, motor speed can be geared down as much as a ratio of 27:1 to provide the power to lift a weight of more than a pound. The motor and gearbox can be easily mounted in a toy or model by simply using cement or screws.

The miniature motor weighs little more than an ounce and the gearbox even less. The cellulose acetate housings and gears are shatterproof, dielectric, highly corrosion-resistant, and unaffected by most oils and grease.

HELPFUL BOOKLETS FREE!

CARBON BLACK PIGMENTS. Booklet explains the various grades of Cabot Carbon Black materials and gives details on the types available for the plastics industry. Godfrey L. Cabot, Inc. **(K-207)**

FORMICA PRINTED CIRCUITS. Literature describes a printed circuit development which employs a photo-etch process to convert a working drawing to a working part of foil-clad plastic laminate. The Formica Co. **(K-209)**

PEARL ESSENCE. Magazine reprint tells what pearl essence is and explains how it is applied in lacquer form to various products by dipping and spraying. Mearl Corp. **(K-220)**

"SELECTRON" POLYESTER REINFORCING RESINS. The general properties, curing characteristics, catalysts, stability, and special types of "Selectron" polyester resins are described in a manual published by Pittsburgh Plate Glass Co. **(K-226)**

PLASTICS FINISHING. Description of a method and machine for removing fins and flash from molded parts with special non-abrading particles. American Wheelabrator & Equipment Corp. **(K-233)**

Any of the booklets described here plus many others—forty-four in all—are available for the asking, without charge or obligation.

Just turn to the Manufacturers' Literature page in this issue (it's printed on heavy colored paper), circle the numbers corresponding to the booklets you want, fill in the reply postcard, and mail. No postage needed.

We'll see that you get the literature you request promptly.

A Service Of

MODERN PLASTICS

A Breskin Publication

575 Madison Ave., New York 22, N.Y.

Monsanto PLASTICIZERS for MODERN heat-sensitive adhesives

The glue pot is becoming as obsolete as the surrey with the fringe on top. High-speed machinery for fabricating, packaging, and labeling needs *modern*, heat-sensitive adhesives that keep pace with today's way of doing things.

Monsanto Plasticizers can help you formulate adhesives that high-speed production demands. With these plasticizers, you can make superior adhesives based on polyvinyl acetate, zein, casein, polyvinyl butyral, styrene, ethyl cellulose and vinylidene chloride.

Meet *your* customers' needs for modern adhesives for labeling, sealing or fabricating . . . or adhesives for special applications . . . with bonding agents made with Monsanto Plasticizers. For information on the use of Monsanto Plasticizers in adhesives . . . or for technical service . . . contact the nearest Monsanto Sales Office, or MONSANTO CHEMICAL COMPANY, Organic Chemicals Division, 1700 S. Second Street, St. Louis 4, Missouri.

MONSANTO PLASTICIZERS for heat-sensitive adhesives

Diphenyl Phthalate

Physical Constants

Molecular weight	318.3
Refractive index at 74° C.	1.572
Specific gravity at 20° C.	1.28
Flash point	435° F. (224° C.)
Boiling point (760 mm.)	405° C.
Physical form	White powder
Melting point	Approx. 69° C.

Specifications

Appearance	Coarse white powder or fused solid having a slight yellowish cast
Acidity (as phthalic)	0.20% max.
Free phenol	0.20% max.
Ash	0.05% max.
Moisture	0.50% max.

Santicizer 1-H

Physical Constants

Molecular weight	253
Density (solids)	1.125
Crystallizing point	86°-87° C.
Physical form	White crystals
Boiling point	350° C. (approx.)

Specifications

Appearance	Fine, white crystals
Melting point	86° C. min.

Santicizer 3

Physical Constants

Molecular weight	199.3
Density (solids)	1.253 gm./ml.
Flash point	371° F. (188° C.)
Melting point	59.0° C.
Physical form	Practically white solid
Boiling point (760 mm.)	340° C. (approx.)

Specifications

Appearance	Practically white solid
Maximum color	APHA 60 (molten)
Melting point	58.0° C. min.
Acidity (as acetic)	0.10% max.
Refractive index at 65° C.	1.512-1.532
Specific gravity at 65/65° C.	1.166-1.176

Santicizer 9

Physical Constants

Molecular weight	171.2
Density (solids)	1.353 gm./ml.
Flash point	420° F. (206° C.)
Melting point	105° C.
Maximum color (molten)	Barrett 3.5
Physical form	Fine granular particles
Boiling point (760 mm.)	360° C. (approx.)

Specifications

Appearance	Fine white to light cream granular particles
Melting point	105° C. min.
Melt	Liquid, clear and light yellow
Maximum acidity	pH 4.6, minimum in dilute acetone (2-gram sample in 15 cc. A.R. acetone and 35 cc. of CO_2 free distilled water)

PLASTICIZERS

DISTRICT SALES OFFICES: Birmingham, Boston, Charlotte, Chicago, Cincinnati, Cleveland, Detroit, Houston, Los Angeles, New York, Philadelphia, Portland, Oregon, San Francisco, Seattle, Twin Cities. In Canada, Monsanto Canada Limited, Montreal.

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Have you anything to MOLD in NYLON?

Pictured are a few of many Nylon parts SINKO has molded for some of America's leading manufacturers

SINKO, a pioneer in Nylon Molding, is now supplying a great many industries with parts made of this remarkable plastic material. Nylon has properties that are highly desirable, especially in mechanical parts; and tends to improve and develop the products in which molded Nylon parts are used.

Check these outstanding Nylon characteristics:

- ✔ Unusual strength and resiliency
- ✔ Resistance to wear, to impact, and to shock loads
- ✔ Endurance to abrasion, corrosion, and prolonged immersion
- ✔ Attractive appearance and long life
- ✔ Withstands effects of chemical and excessive temperatures
- ✔ Silent and self-lubricating

SINKO molds all other Thermoplastic Materials, including the remarkable new KEL-F . . . in sizes from 4 to 60 oz. A highly skilled staff of specialists, using the latest in modern equipment, will manufacture your injection molded parts and products with the utmost in accuracy, speed, and economy.

Our services include Design and Engineering; Mold Construction; Metal-Plastic Assemblies; 2 and 3 color Plastic Spraying and Painting; Hot Stamping; Vacuum Distillation Plating; Fabricating and Assembling.

✔ Check with us on your Nylon and other Plastic Molding applications . . we'll be glad to furnish you with test samples!

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Corrections to the 1952 Modern Plastics Encyclopedia

THE Editors of the MODERN PLASTICS ENCYCLOPEDIA AND ENGINEER'S HANDBOOK make every effort to prevent the infiltration of errors. However, a few mistakes have crept in. Readers will please note the following corrections:

Advance Solvents and Chemicals Corp., 245 Fifth Ave., New York, N.Y., were omitted from the list of Manufacturers of Plasticizers on page 708 of the Technical Section.

Baldwin-Lima-Hamilton Corp., in the alphabetical list of manufacturers on page 825, is located at Philadelphia 42, Pa., not Hamilton, Ohio.

Chicago Mold Engineering Co., Inc., erroneously listed on pages 756 and 757 of the Directory as being located at Hillside, N.J., are at 4141 Washington Blvd., Hillside, Ill.

Durez Plastics & Chemicals, Inc., N. Tonawanda, N.Y., points out that on page 454 of the Resins and Molding Compounds Section, a misunderstanding concerning date of entry into the phenolic field by various companies is indicated. While "since the expiration of the basic patents (Baekeland's of 1910 and 1912), many firms have sold the phenolics under various tradenames," both Durez Plastics & Chemicals, Inc., and Brunswick-Balke-Collender were manufacturing and selling phenolic compounds before those patents expired.

Interchemical Corp.'s Finishes Div., 224 McWhorter St., Newark, N.J., was unfortunately left out of the listing for Inks for Printing Plastics on page 748.

To Irvington Varnish and Insulator Co., Irvington 11, N.J., our deepest apologies concerning their tradename listings. The following tradenames were misquoted and are now correct as follows: Irv-O-Lite XTE-30—plastic tubing; Transflex—transparent plastic tubing; Hyflex—low temperature plastic tubing; Fibron tape—plastic tape.

In the Custom Molders and Extruders listings on page 780, the ex-

ecutive personnel listing for National Plastics, Inc., Knoxville 2, Tenn., is erroneous. Vice president of the organization in charge of sales and foreign relations is Charles L. Yeomans. Secretary of the company is G. B. Reed.

Plastic Age Co., 649-657 Arroyo Ave., San Fernando, Calif., should have been listed among the reinforced plastics processors as molders of polyester resins, phenolics, silicones and alkyds, reinforced with fibrous glass. The same company is missing from the Laminators Section beginning on page 781. This company produces flat laminate sheets from polyester and acrylic resins with nylon and fibrous glass reinforcements.

It has been pointed out that the listings for Resistoflex Corp., Belleville, N.J., on page 729 of the Directory and in the Plastics Properties Chart were erroneous. Resistoflex is a producer of rod, sheet and other products which they manufacture from fluorocarbon raw material.

To Russell Reinforced Plastics Corp., 9 So. 13th St., Lindenhurst, L.I., N.Y., our special apologies. In the first place they are missing from the acknowledgements on page 7. In the second place, photographic credits to Russell are missing from pictures on pages 171, 174, and 175. In addition, their vice president, Harry Friedman, prepared much material for the Laminating and Reinforced Plastics Section beginning on page 168. To Mr. Friedman our sincere thanks, and our apologies for the regrettable omission of his much-deserved by-line.

Tumb-L-Matic Inc., 4510 Bullard Ave., New York 70, N.Y., were omitted from the classification Barrels, Tumbling, in the Equipment Section of the Directory on page 740.

Thermo-Plastic Corp., 2911 S. Archer Ave., Chicago 8, Ill., should be listed under Specialized Services as reclaimers of plastic scrap on page 758 of the Directory.

S. Wexler & Co., 6866-68 S. Keefe Ave., Chicago, Ill., omitted from the Directory, should have been listed as reclaimers of plastic scrap, as dealers in plastic scrap, and also as dealers in molding compounds.

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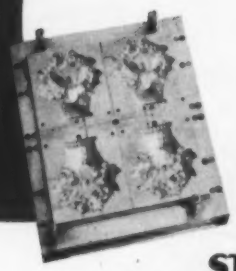

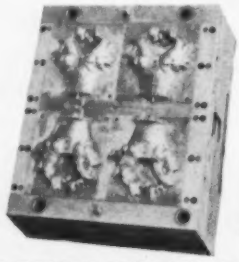

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Power Packs

(*Continued from pp.* 114-15)

costs and operations. Easily cleaned and kept clean, it has excellent "counter appeal" to prospective buyers.

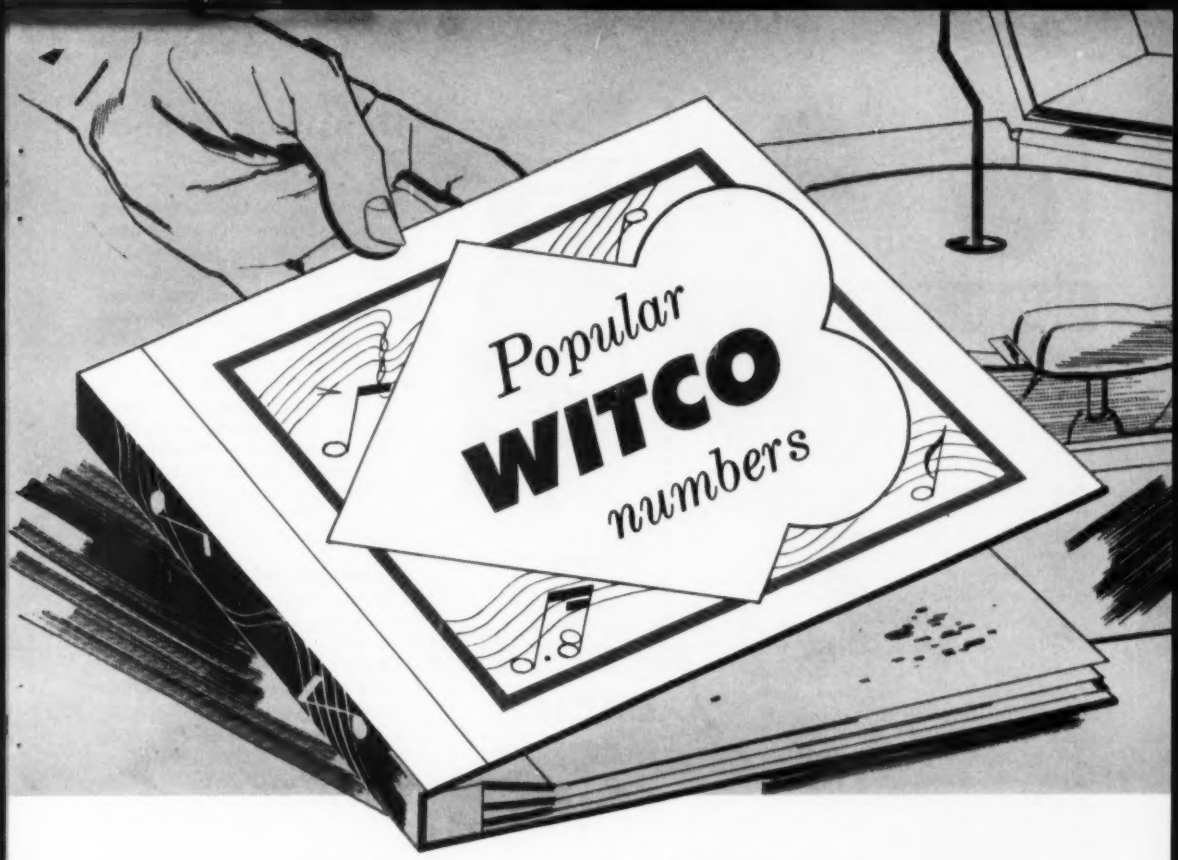
Impossible in Other Materials

According to Mr. Farber, the use of this easily fabricated thermoplastic sheet material permitted a design and assembly which would have been almost impossible in other materials. Its flexibility, for example, permits somewhat greater tolerances in production with very satisfactory final assembly. This characteristic also made it possible to "stretch" the plastic in place over the lamp assembly, obtaining a secure fit without screws or other fasteners. Due to the water resistance of the Royalite case and lamp housing, the unit may even be used in rainy weather without fear of missing pictures.

In this company's new Stroboflash II portable units, which utilize two 225-volt batteries in series for a total of 450 volts, the power pack housing is fabricated in two parts—a black base and a grey cover which telescopes down over it. The upper half houses the formed copolymer sheet chassis on which all electrical components are mounted, while the lower section fits the two batteries. When the two halves are brought together, electrical connections are made automatically. Secure assembly is attained through the use of Simmons fasteners at each side of the case which also pass through the extra wide, comfortable extruded vinyl shoulder strap supplied by Sunlight Mfg. Co., Milwaukee. Plastic strap buckles provide length adjustment.

As mentioned above, the formed plastic material is also employed as a tough, water-resistant cover over the Stroboflash flash lamp, which is equipped with standard tripod socket and so designed that it may be easily mounted on miniature camera and standard battery cases. The lamp units are equipped with a transparent Plexiglas cover furnished by Weber Brass Co., Cleveland, Ohio.

Recognizing the suitability of formed copolymer sheet material for photographic equipment, Strobo Research is planning to redesign a number of its other products to make use of this type plastic.



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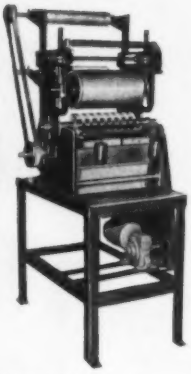

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Densified Wood

(*Continued from p.* 101)

the inside of the instrument gets wet in use while the outside remains dry. Also, the instrument is subjected to a wide range of temperatures; "hot clarinet" is not exclusively a musical expression! Carefully controlled heat and moisture tests by Pan-American research engineers, establishing the suitability of resin-modified wood for these instruments, have been confirmed by their performance in actual service. In fact, the new V-F clarinets and oboes are guaranteed against cracking, checking, or splitting under normal usage.

Fabricating Procedures

In producing these instruments, Pan-American machines the densified wood with lathes, drills, and other conventional wood working equipment. Special Carboloy tools reduce fabricating temperatures. Machining properties of the material are excellent; the finished components may be brought to an attractive gloss merely by buffing. No applied finish which might wear off or grow dull through constant handling is required. The densified wood is identical in specific gravity with the best Grenadilla wood, used in the highest quality and most costly instruments of this type. In addition to its durability, which minimizes the possibility of breakage due to careless handling, the densified wood is relatively economical, resulting in a retail price for the finished clarinet approximately 7% below that of a comparable instrument in Grenadilla wood.

The new clarinet, made in B-flat and using the Boehm system with 17 keys and six rings, features adjustable pivot screws, extra sturdy key mechanism, full professional bore, and accurate intonation. The oboe, built in C, simplified Conservatory system with low B-flat key, has a double octave mechanism, flexible scale with full oboe tone. Keys are of special formula nickel silver with tempered nickel plating.

The outer shells of the deluxe type streamlined, light-weight cases, molded of fibrous glass impregnated with Bakelite polyester resins, are produced by Auburn Button Works, Inc., Auburn, N. Y.—END

Refrigerette

(*Continued from pp.* 111-13)

metal back by means of thread cutting screws. Use of blind cores instead of threaded inserts at points of attachment speeds the molding cycle and eliminates possible cracking around inserts. There are also three additional blind cores on projecting studs extending from the inner side of the front panel; these are used in attaching the inner liner across the bottom with thread cutting screws. All cores in this cabinet component are straight draws, simplifying mold construction and expediting the molding cycle.

Top is Useful

A slight crown (⅛ in.) on the top of the cabinet improves the appearance of the unit and contributes additional strength. For all practical purposes, however, the top is flat. At the edge of the top surface, the cabinet is slightly recessed with an upturned margin where it is joined by the louvered metal back, finished to match the cabinet. Eight holes are drilled in the top of the ledge across the front of the cabinet for attachment of door hinges. This drilling is handled by the compression press operator following removal of the cabinet from shrink fixtures.

The cabinet is molded on a 1200-ton Versen compression press, using weighed, electronically preheated preforms. Production averages around 12 shots per hr., or 100 cabinets per 8-hr. shift. The tool used in molding the phenolic cabinet weighs more than six tons and was made by Gaugler Machine Tool Co., Kent, Ohio.

When the piece is removed from the punch, a paper-thin flash covers the rectangular opening in the front of the cabinet, except for a circular opening in the center made by a leader pin. This web of material, which facilitates flow of the plastic as the press closes, is knocked out manually by the press operator before he places the part on a cooling fixture. Padded cross braces are laid across the front opening while the cabinets are cooling to insure squareness.

The adjustable rubber feet and optional tubular metal legs of the cabinet are fastened to it by means of threaded inserts, set in rubber pads,

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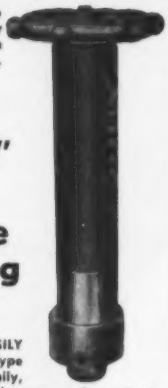

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which are cemented directly to the bottom of cabinet by the Servel Co.

Grain Matched

The phenolic door cover, weighing 5⅛ lb. and measuring 14½ by 25 in., is produced on a Williams-White 1200-ton compression press, using electronically heated preforms. In order to obtain the desired grain pattern in the finished piece, preforms are concentrated in the center of the cavity, producing an attractive radiating grain, closely matched with respect to the center line, as the material flows toward the outer edge of the molding.

The front surface of the door has a recessed panel into which the name plate mounts and a square opening through which the latch mechanism passes. The open edge is designed with a step which mates with the margin of the door liner. The back surface of this part has a series of cored bosses around the edge for attachment of the liner with thread cutting screws, plus additional cores for attachment of the latch assembly. Near the lower corner of the door, on each side, are two other cores in bosses supported by heavy ribs. These provide firm attachment for the slotted metal retainers which hold the door in horizontal position when opened. Six openings in the back edge of this piece, through which the hinges are mounted at each end, are produced by drilling after removal of the part from the press.

The inner liner of the Wonderbar, molded of Styron 475 in a cream color, weighs 3¾ pounds. In view of the fact that refrigeration men for some time have been discussing the eventual use of molded plastic liners for conventional refrigerators, this piece may prove to be highly significant, representing as it does the first actual production use of such a liner.

The liner is molded on a 300-oz. Watson-Stillman injection machine equipped with a pre-plasticizing chamber and a weigh-feed mechanism which meters precisely the required amount of material into the pre-plasticizing chamber between shots. It is produced at a rate of about 50 shots per hour. The two gates in the back of the part feed from a center sprue. The piece is not fully enclosed at the back but molded with an opening extending

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all the way across which affords access to the refrigeration mechanism during assembly. This opening is later closed by a liner baffle plate of the same material.

Cabinet Attachments

The liner is designed with a flange or margin across the top and bottom and along the sides as far down as the ledge across the front of the phenolic cabinet, where the liner recesses to conform. Cored openings around this outer edge provide attachment to the cabinet by means of thread cutting screws. There are also four openings in the back, through which the baffle plate is fastened across its lower edge, and three cores in each side of the liner, near the front, where the door support strips are anchored. These side openings are formed by core pins located within the punch. The liner is molded with a heavier section at this point to absorb stresses set up when the refrigerator door is open.

Three integral inner rails molded on each side of the liner support the chill shelf in a choice of three positions. The bottom inner surface of the liner has lateral ribs which promote air circulation and provide added rigidity, as well as preventing the liner from becoming scratched or marred in usage. At the top center, the liner has a recess for the durable nylon latch roller. Two side cores at this point provide means of attachment.

The two molded copolymer parts which complete the inner liner are the liner baffle plate and the liner front. As mentioned above, the baffle fits into the back of the liner and is assembled by Servel after installation of the refrigeration unit. It has a tongue and groove design at the top which locks it into position at that point; four cored holes across the bottom edge provide for attachment. Slots at each end of this 8-oz. part afford air circulation and the entrance of cold air into the food compartment from the mechanism located behind the liner.

Moisture Sealed Out

The liner front fills the space across the lower front of the liner. It is mounted in place by the molder. The front is cemented in position with toluene and the joint further sealed with waterproof cement.

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molded copolymer parts for the Wonderbar is the inner door liner, which doubles as a shelf surface when the door is opened. Weighing 1 lb. 5 oz., this part is run on a 32- or 48-oz. injection machine. Cored openings in this part—all of them straight draws—include 24 holes for attachment to the phenolic door part, four openings where the door support strips fasten through into cores in the outer door, and a cross-shaped cutout for the latch assembly. Like the bottom of the cabinet liner, this piece has ridges which provide an attractive, scuff-resistant surface. The Servel name, within a border, is molded directly into the ribbed surface. The entire piece has a slope or bevel leading away from the flanged edge, to accommodate the rubber insulating gasket. Screws which hold the gasket in place and join the door parts together with insulation between them are concealed beneath the edge of the gasket.

No-Slosh Tray

Particularly interesting from the functional standpoint is the combination chill shelf and defrost tray, injection molded of clear transparent styrene. This piece has reinforcing ribs running in both directions on one surface, while the reverse side carries lateral baffles or dividers which prevent water from sloshing out when the defrost tray is being emptied. Notches at alternating ends of the baffles permit even distribution of water in the tray. Sturdy projecting strips at each end of the tray support it on the inner cabinet rails. The tray is recessed along its front edge so that tall bottles can be accommodated in the front of the cabinet.

The amber styrene nameplate is hot stamped and vacuum plated to complement the ring-type latch handle. A honeycomb pattern is molded into the back of the piece, which mounts directly in the phenolic door front.

The temperature control knob, compression molded of maroon phenolic, has a series of settings from "1" to "12" and "D" for defrost molded and wiped in for increased legibility. This part, molded with a milled edge for easier gripping, mounts horizontally near the back of the cabinet with only a section of the edge visible.—END

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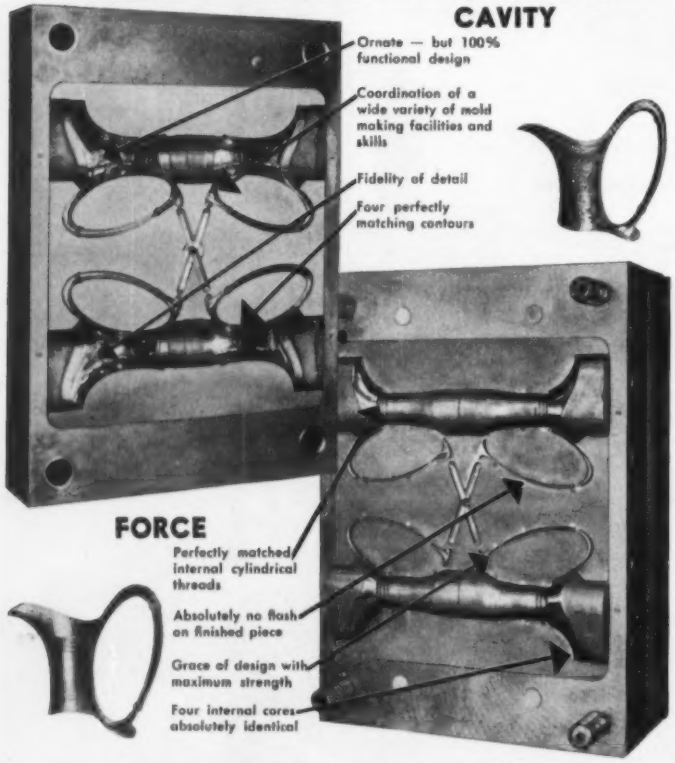
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Nylon-Phenolic

(*Continued from pp.* 137-40)

felt that such a reduction was desirable.

The following data have been obtained from various manufacturers of the nylon-phenolic laminate and represent their minimum and maximum values. Data on insulation resistance have been omitted. In general, values have been obtained by applicable A.S.T.M. methods.

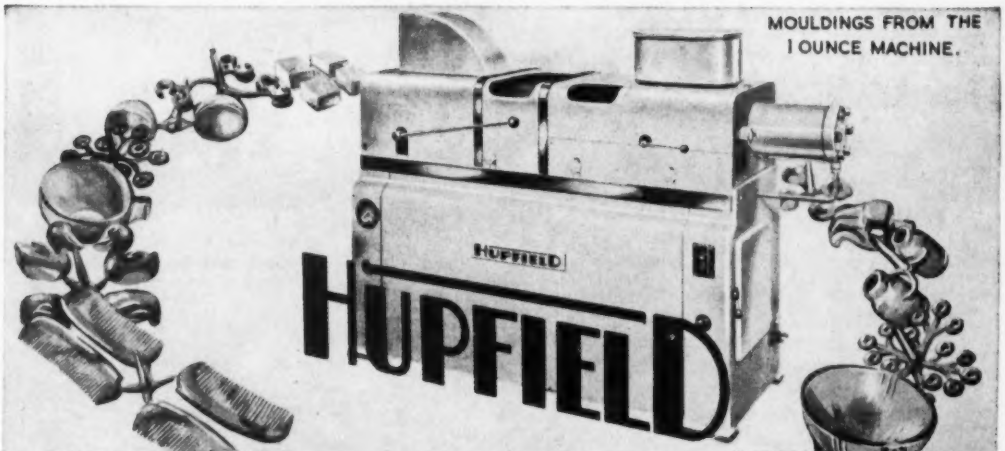
Specific volume, cu. in./lb.	24
Water absorption, %	0.17-0.59
Tensile strength, p.s.i.	5700-9250
Compressive strength, flatwise, p.s.i.	35,000-48,000
Flexural strength, p.s.i.	11,000-20,000
Impact strength, ft.-lb/in. of notch	4.4-12
Power factor at 1 mc	0.013-0.016
Dielectric constant at 1 mc	3.0-4.4
Dielectric strength, short-time, v./mil.	360-550
Dielectric strength, step-by-step, v./mil.	220-375
Arc resistance, sec.	9-50

In January, 1950, specification MIL-P-15047, covering this nylon-phenolic laminate and entitled "Plastic Material, Laminated, Thermosetting, Sheets, Nylon Fabric Base, Phenolic Resin Type NPG," was issued. This specification, amended July, 1950, was approved by Army, Navy, and Air Force.

Nylon-fabric phenolic laminates of the following manufacturers have been approved for terminal-board use in Hazeltine civilian and military electronic equipment:

Manufacturer	*Designation*
Continental-Diamond Fibre Co.	Dilecto MEC-5
Formica Insulation Co.	Formica YN-25
Franklin Fibre-Lamitex Corp.	NN Lamitex
Mica Insulator Co.	Lamicoid 6051
National Vulcanized Fibre Co.	N-850
The Richardson Co.	Insurok T819
Panelyte Division, St. Regis Sales Corp.	Panelyte 190
Synthane Corp.	Synthane N.P.
Taylor Fibre Co.	NS

—END



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SHOT CAPACITY	1 OUNCE	2 OUNCE
Moulding Area	12 sq. ins.	22 sq. ins.
Plasticizing Capacity per Hour	11 lbs.	22 lbs.
Injection Pressure	5½ tons	11 tons
Mould Locking Pressure	22 tons	44 tons
Mould Opening	4½"	7"

	1 OUNCE	2 OUNCE
Heating Unit Consumption	1000 Watts	2000 Watts
Motor, Electric	3 H.P.	6 H.P.
Hydraulic Pump	Vickers V.105-A	Pesco 3H58CX
Size of Base	4'8" x 1'10"	5'8" x 1'10"
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INJECTION MOLDING MACHINES AND MOLDS. Detailed specifications on PECO 2-, 4-, 6-, 8-, and 16-oz. injection molding machines and the mold building facilities of the Projectile & Engineering Co., Ltd. (K-208)

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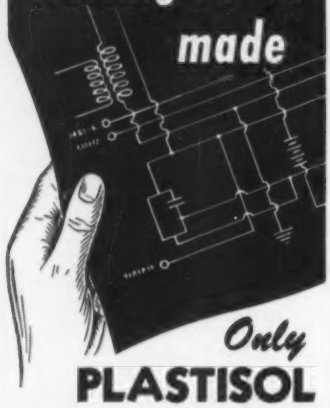

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Finishes

(*Continued from pp. 142-4*)

ishes, shows no appreciable difference between the 114 finish and any of the three new finishes when tested dry. However, in the wet condition after 24-hr. immersion in water at 73° F., both the dielectric constant and the loss tangent are slightly better than the 114 finish. This improvement would be more apparent if the immersion condition was extended for a longer period. In view of the great improvements shown by the new finishes, applicable U. S. Air Force specifications on polyester glass fabric laminates, honeycomb core, sandwich construction, and laminating resin, are being revised to take advantage of these developments. It is considered that the specified values will be such that all three of the new finishes will meet the requirements of the specifications.

In conclusion, it is desired to emphasize the importance of the next steps. One is to bring about the production utilization of these improvements in glass fabrics. Another is to develop these same improvements in non-woven glass fibers reinforcements, such as mat, roving, and warp. Finally, it is believed that the best results will probably eventually be obtained in the proper sizing of the glass fibers as they are drawn by the glass fiber manufacturers.

Figs. 1 and 2, illustrating the effects of moisture on the room temperature stress-rupture and fatigue properties, are located on the facing page.

Table VI—Wet Compressive and Tensile Strength Retention of Laminates Prepared with Selectron 5003 and 181 Fabrics with Various Finishes

	Strength of ⅛-in.-thick laminates				
Finish	*Dry (75° F., 50% R.H.), p.s.i.*	*2-hr. boil, p.s.i.*	*Retention, %*	*30-day immersion, p.s.i.*	*Retention, %*
	COMPRESSION				
Bjorksten	46,200	45,700	99	—	—
Garan	41,500	—	—	37,700	91
O-C 136	39,500	45,100	114	—	—
O-C 114	40,400	22,900	57	24,500	61
	TENSILE				
Bjorksten	45,200	52,900	117	—	—
Garan	48,100	—	—	51,200	106
O-C 136	40,800	43,100	106	—	—
O-C 114	44,500	34,000	77	33,400	83

Table VII—Wet Compressive and Tensile Strength Retention of Laminates Prepared with 181-136 Fabric and Various Polyester Resins

	Strength of ⅛-in.-thick laminates		
Resin	*Dry (75° F., 50% R.H.), p.s.i.*	*2-hour boil, p.s.i.*	*Retention, %*
	COMPRESSION		
Selectron 5003	39,500	45,100	114
Paraplex P-43	45,800	41,150	91
Laminac 4115	39,400	39,800	101
Marco 21 C-3	36,700	36,900	101
Selectron 5103	39,400	38,800	98
Bakelite QRS-147	37,300	35,900	96
	TENSILE		
Selectron 5003	40,800	43,100	106
Paraplex P-43	40,500	34,900	88
Laminac 4115	41,000	40,700	99
Marco 21 C-3	35,200	34,700	98
Selectron 5103	36,000	33,300	93
Bakelite QRS-147	34,700	34,500	100

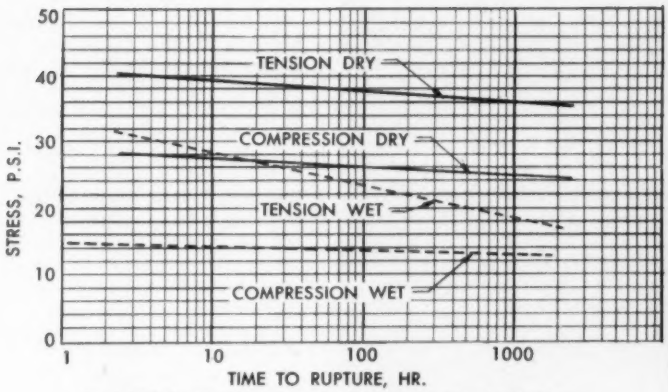
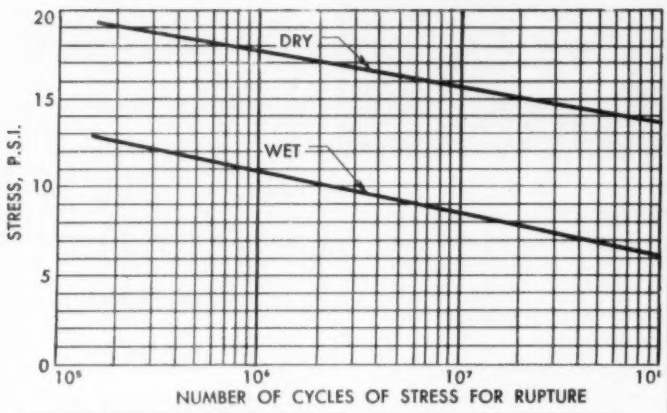


Fig. 1 (above)—Stress-rupture curves for laminates prepared with polyester resin and 181-114 glass fabric. Fig. 2 (below)—Krouse reverse bending curves for ⅛-in. thick laminate prepared with polyester resin and 181-114 glass fabric. These two figures refer to article on facing page



Silicone Resins

(*Continued from pp.* 146-148)

moved from the precure. It may be shaped and straightened at this point. On cooling, the stock is flexible with practically no tack. Advantage may be taken of the flexibility of the stock when warm to preform and stretch the laminating stock to various shapes before molding. This can be done by warming the stock to approximately 175° F. and stretching it over a cold mold.

Molding—If proper flow and gel time are obtained, 2104 laminating stocks may be laminated similarly to the other conventional low-pressure resins. However, it is desirable to breathe or bump the laminates sometime during the closure cycle. It is best to allow the laminating build-up to heat up to laminating temperature of 347° F. under contact pressure before starting the closure. For an 8-in.-square laminate containing 12 to 14 plies of the laminating stock this takes approximately ½ minute. If the laminate is to be bumped, this should be done immediately after this first warming period. The pressure should then be increased gradually until 30 p.s.i., or other laminating pressure, is had at about ½ min. before gelation.

For lamination in a positive mold or in a bag mold it has been found satisfactory to place the layup in the mold and close immediately, maintaining the desired pressure during the curing cycle. In vacuum molding it is not necessary to bump the lamination as vacuum withdraws volatiles during the cure.

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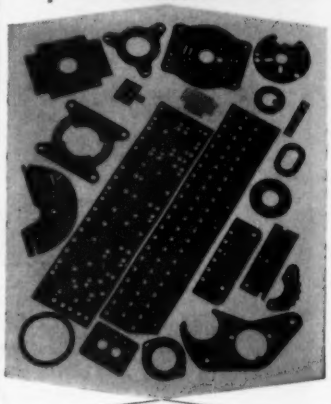

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ent upon the thickness of the laminate. A 15-min. cure is recommended for $\frac{1}{8}$-in. laminates. A 30-min. cure is recommended for $\frac{1}{4}$- or $\frac{1}{2}$-in. laminates. Laminates thicker than $\frac{1}{2}$ in., up to 2 in., should be cured for 1 hour. Laminates made in a bag, vacuum, or metal mold should be cured for $\frac{1}{2}$ hour. All laminates should be cooled to below 212° F. before removal of pressure.

In order to obtain the best high temperature properties on the silicone laminates it is necessary to give them an additional cure in an oven after they are removed from the press. The following aftercure schedule is recommended: 16 hr. at 194° F., 1 hr. at 257° F., 1 hr. at 302° F., 1 hr. at 347° F., 1 hr. at 419° F., and from 80 to 150 hr. at 482° F. At no time during the aftercure should the laminates be allowed to cool off. No difficulty with distortion of complex molded parts has been encountered when using this aftercure schedule.

Figure 1 shows the comparison of aftercures at several temperatures and stresses the importance of a minimum aftercure of approximately 80 hr. at 482° F. In Fig. 1 the percent retention of room temperature strength is the strength at 500° F. divided by the strength at 77° F. times 100.

The average strengths obtained from low-pressure 2104 resin laminates are given in Table I. These values are averages of a number of tests. All tests were conducted on flat laminated. From these data it may be seen that the main advantage

Fig. 4—Bag molding of four-ply boat with aluminum cavity and rubber bag

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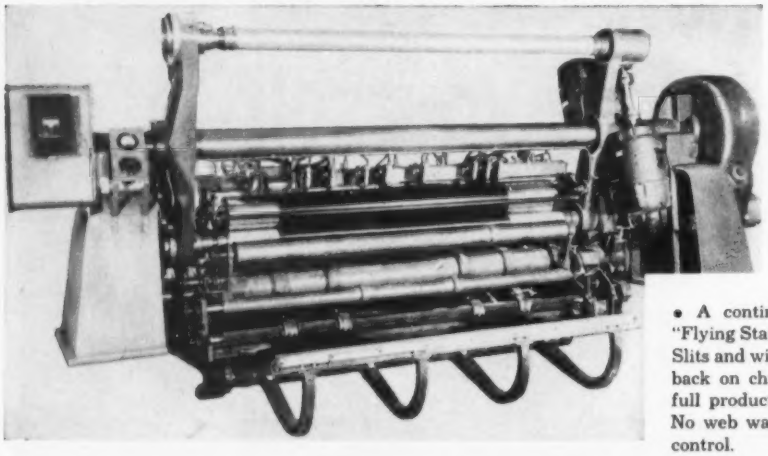

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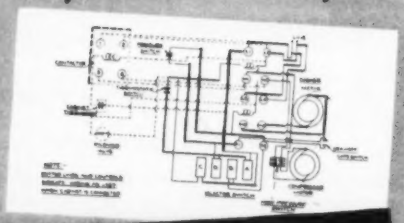

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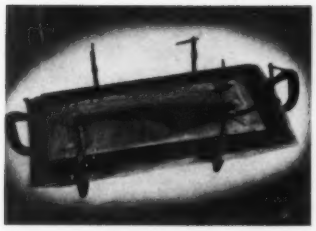

Fig. 5—Bag and mold for boat are assembled and vacuum pressure applied

of silicone laminates is the maintenance of strength after long after-baking periods at high temperatures. To the present time, tests indicate that no additional deterioration of silicone laminates occurs up to 500° F. for 200 hr. of aging. At 600° F. there is some loss of strength on aging for 200 hours. Preliminary tests indicate that the strength of these silicone laminates for short exposures is as good up through 700° F. as it is at 400° F. These tests have also indicated possible usage of silicone laminates for short time exposure through 900° F. The curves showing the effect of heat on low-pressure laminates prepared from 2104 resin in Fig. 2 are almost identical in shape for aged and unaged specimens. It is thought that this is due to a softening of the resin between 200 and 300° F. after which the increase in temperature makes little difference up to much higher temperatures.

Sieffert and Schoenborn[1] defined the Critical Thermal Instability Temperature of a plastic laminate as that temperature above which it is inadvisable to use the material because of significant thermal decomposition. It was shown that the Critical Thermal Instability Temperature of silicone laminates was near 700° F. The data on the strength of these laminates above 500° F. are entirely preliminary. From these data and a knowledge of silicone chemistry, however, it can be predicted that silicone laminates can be prepared which should be thermally stable to nearly 700° F. and serve well for short exposure to temperatures approaching 1000° F.

Lamination of Complex Shapes

As mentioned previously, laminating stocks of 2104 resin and 181

[1] Ind. Eng. Chem. *42*, 496 (1950).

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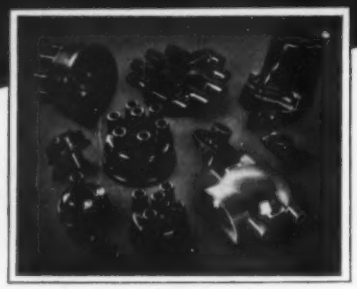

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glass fabric may be formed into complex shapes by extremely low pressure techniques. The boat shown in Fig. 4 was laminated at 14 p.s.i. in the apparatus shown in Figs. 4 and 5. The mold shown in Fig. 4 consists of an aluminum female portion and a male bag portion fabricated from Silastic 250. Four plies of laminating stock were cut to predetermined shape and molded under vacuum pressure at 347° F. for ½ hour. Calcium stearate was used as a release agent. Figure 5 shows the mold assembled and ready for application of the vacuum. This boat illustrated is approximately 25 in. long.

Another item molded by vacuum technique was the 3-in.-diameter dome shown in Fig. 3. This was molded in the same manner as the boat in the apparatus shown in Fig. 4. This same dome has also been molded in a seamless model by the use of matched magnesium molds at 3 p.s.i. In order to prevent overlapping, the laminating stock was preformed by heating to 176° F. and stretching over a cold metal form. These molded pieces are superior to those that are made with overlapped seams.

Tubes have been made from laminating stocks of 2104 resin and 181 fabric by rolling over metal mandrels. Tubes as large as 8 in. in diameter have been prepared in this manner, as the illustration in Fig. 6 shows.

A commutator V-ring for a DC motor 15 in. in diameter was molded in this laboratory in a matched steel

Fig. 6—Tubes from laminating stocks are made by rolling over mandrels

mold. In order to make this double draw molding, the laminating stock was placed over the mold which had been heated to 500° F. The mold was closed at a few p.s.i. The stock drew well into the mold as no folds were apparent in the finished ring. A new Dow Corning release agent, XE-135A, was employed in this molding.

Other laminating techniques used in the low pressure field should also be applicable to laminating with these materials. If properly handled, plaster molds should be usable for the formation of duct work. Rather than the conventional polyvinyl alcohol release coating, it is advisable to employ methyl cellulose because of its greater resistance to the 347° F. laminating temperature. This material may be used the same as the polyvinyl alcohol coating.

Conclusion

It has been demonstrated that Dow Corning 2104 resin and glass fabric are adaptable to low-pressure laminating techniques.

The physical properties of these laminates are particularly good after long aging periods up to 500° F. These results are of a preliminary nature and the actual limit of endurance of 2104 resin laminates for exposure to increasingly high temperatures (700, 800, 900° F.) has not been determined.

In addition to the work discussed here, new silicone resins were evaluated on this program. Laminates prepared from these resins have shown superior heat resistance to even the 2104 laminates. However, the new resins have only been made in experimental quantities, so there will be some delay before they are available in quantities sufficient for thorough investigation. The work on these new resins is continuing under Air Force Contract.

This research has merely opened the door to the use of low-pressure silicone laminates. Although the techniques for handling and molding these resins may be somewhat specialized, they yield a laminated plastic material that is stable at high temperatures. These low-pressure silicone laminates, with their extended heat resistance above 500° C., and their ability to be formed into complex shapes, give the aircraft designer a new engineering material to meet the requirements of supersonic aircraft.—END

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THE PLASTISCOPE*

NEWS AND INTERPRETATIONS OF THE NEWS

By R. L. Van Boskirk

The Future for Mylar

AN unusual amount of interest is prevalent in the plastics industry today about a product that probably will not even be available in commercial quantities until late 1954 or early 1955. The extreme enthusiasm has no doubt arisen because a great many samples are in circulation indicating that a product of great potentiality is about to have a "coming out" party in the not too distant future.

The product is Du Pont's "Mylar" polyester film. About a year ago, it was announced as an experimental film, and samples were distributed for evaluation. Apparently the possibilities proved so intriguing that prospective users are impatient to get their hands on it. In their enthusiasm, they talk about the material as something already here, without bothering to think about availability or possible cost.

"Mylar" film is notable for several outstanding properties which have equal ratings to or better than other materials which might be used for competitive purposes. Those properties include strength, clarity, inertness, resistance to high temperatures and good dielectric strength. But like any other high-quality merchandise, "Mylar" today is high-quality in price—about $3 per lb. for 7 mil film, $4 per lb. for ¼ mil film. Therefore, it seems quite obvious that "Mylar" polyester film is not destined to compete with cellophane or polyethylene film on a price basis—at least not for several years to come.

Unfortunately, this cost factor will dampen the spirits of many enthusiasts who have looked upon "Mylar" as a super-duper packaging material. But it hasn't dampened the enthusiasm of Du Pont, which is confident that this material will reach a high production level in other fields, even though an ounce were never to be used for packaging.

* Reg. U. S. Pat. Off.

This enthusiasm is based on the knowledge that "Mylar" is capable of superior performance in numerous applications where its properties are unusually applicable.

"Mylar" is 2 to 8 times stronger than any known film. Its tensile strength at 77°F. is around 25,000 lb. p.s.i. in comparison to 2400 for polyethylene and 11,000 for cellulose acetate. In sections as thin as 0.00025 in., it possesses a tensile strength equivalent to about one third that of high strength steels. Impact strength is 75 kg./cm. for a 1 mil section, compared to 8 for polyethylene and 3 for cellulose acetate. It can be furnished in film as thin as ¼ mil, in comparison to the thinnest cellophane, which is about one mil. "Mylar" retains most of its mechanical properties at temperatures from −60° to 325° F. Even after 1000 hr. of heating at 325° F., the mechanical strength is still remarkably high. After immersion in boiling water for four hours, shrinkage is less than one percent. On the other hand, if coils or wire insulated with "Mylar" are given a heat treatment at a temperature over 325° F. after wrapping, the insulation will shrink tightly around the conductor, resulting in a compact, void-free insulation. Although somewhat stiff at low temperatures, no evidence of embrittlement has been observed. At temperatures of 260° F. and above, its flexibility characteristics approach those of polyethylene, although there is no tendency toward plastic flow at that temperature. Softening point is around 460° F. Specific gravity is 1.4.

Some of the end products which it seems likely may be developed from "Mylar" polyester film are as follows:

Storm windows: Experimental windows of the type that may be shifted from summer screens to winter glazing are on trial. Seven-mil "Mylar" polyester film of almost perfect clarity seems ideal. It will remain flexible at −60° F. A baseball thrown at a "Mylar" storm window does not break it. "Mylar" could be used for greenhouses at a lower cost than glass because replacement would be less. It could be used on farms for tacking on hen houses, hog houses, and other buildings, in place of glass or scrim.

Pipe cover: It can be used as a protective cover over glass wool, cork, foamglass, or magnesia pipe covering—it is unaffected by many solvents and other chemicals. It would reduce cost of installation because insulated pipe must generally be covered in the field. If a "Mylar" covering were used, the complete insulation could be shipped ready-to-use in the field.

"Mylar" could also be laminated to foil for wrapping cold pipes in a hot room and employ the insulation value of foil and the physical properties of the film.

Sound recording film: "Mylar" polyester film is believed to have an excellent chance in this field, which is now largely acetate. The polyester film has an extremely high tear resistance. Furthermore, it requires no plasticizer and, therefore, has high dimensional stability.

Industrial tape: "Mylar" can be used with fiber backing for industrial wrapping just as steel tape is used today. It will also be applicable for pressure-sensitive tape in special applications, such as electrical tape.

Laminated to foil or vacuum metalized: Other plastics are used for this purpose, but frequently the combined strength is not enough and there is often extreme elongation. An aluminum foil and ¼ mil "Mylar" combination is extraordinarily strong. Or the film can be vacuum metalized with a one hundred millionth of an in. coating for electrical jobs.

Electrical applications: This is expected to become one of the first and most important fields for "Mylar." Because it can be used in such thin segments, the film is particularly practical for capacitors or condensers, of which there are around 50 in the average television set. Here again it can be vacuum metalized for special jobs. Most of such insulation today requires several thicknesses of paper and foil. Pressure-sensitive electrical tape has already been mentioned. Thin slot wedges for motors is another made-to-order application for this material, in either film or paper laminate. Slot wedges of 5 or 7 mils thickness would fre-

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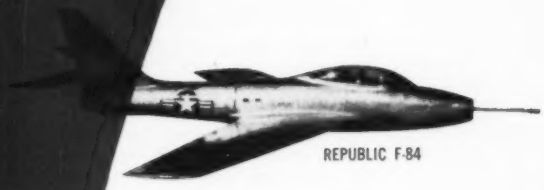

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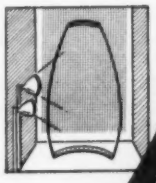

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PLASTISCOPE

quently do the job, but present equipment of the electrical manufacturers won't handle it in such thin sections. Consequently, it may be laminated to paper, but even then it would be much thinner than the resin impregnated heavy paper presently in use.

The material is particularly applicable to electrical equipment because of its tensile strength; dielectric strength of 4000 to 5000 volts per mil; insensitiveness to moisture; dimensional stability over a wide range of relative humidities; resistance to the chemicals used in impregnating, potting, and treating equipment, as well as those used in liquid transformers.

Packaging: As mentioned above, this is a field that will probably develop some day in specialty and heavy duty packaging, but will probably come along after those mentioned above. New packaging equipment would have to be designed to handle it; cost is another deterrent, although ¼ mil "Mylar" film at $4 per lb. would be equivalent on a cost basis to cellophane at $1 per lb. on an area basis, because thinner film could be used. Cellophane today is priced at from 50¢ to 60¢ per pound.

Heat sealing problems would also have to be worked out, and special formulations of ink and adhesives would have to be devised to make "Mylar" a widely used packaging material. However, packaging as a potential outlet is by no means written off completely, for cost reductions following quantity production may some time be expected just as they have come along in cellophane, which was first sold in 1924 at $2.65 per pound. And new methods will be originated for handling the material in due time. But enthusiasts, who have become stricken with the idea that "Mylar" polyester film is suddenly to blossom forth as a bright new packaging item, will have to curb their impatience for some time to come.

New Company in Vinyl Film

PLASTICS operations of the William Whitman Co., one of the largest woolen mills in the nation, have been taken over by the newly-formed Whitman Plastics Corp., 655 Summer St., Lynn, Mass.

John E. Beaumont of Cambridge is president of Whitman Plastics. He was formerly connected with Bakelite and General Tire & Rubber Co. The production manager, William O'Brien, has been in the plastics industry for eight years; the plant manager, Robert L. Fish, was formerly with the Southbridge Finishing Co. and Firestone Industrial Products Co.

The management of the new firm, entirely independent of William Whitman Co., will make calendered vinyl film, both plain and embossed, in thicknesses ranging from 0.0028 to 0.008 in. and thin sheet from 0.010 to 0.012 inches. Rigid vinyl, both calendered and extruded, is expected to become one of the company's principal products. Extruded vinyl and polyethylene welting, belting, rods, pipes, and the usual wide variety of extruded products will also be produced in an expansion of the company's extrusion operations.

Plastics Associates, 286 Fifth Ave., New York, N.Y., have been appointed by the company to handle sales in metropolitan New York and New Jersey.

Certificates of Necessity

CERTIFICATES of Necessity, relating directly or indirectly to plastics, tapered off the last two months. Most of the large certificates pertaining to raw materials had been granted previously. The $7.5 million certificate granted to the American Cyanamid Co. was by far the largest for plastics materials in the most recent list. American Cyanamid has not released any interpretation of its intentions concerning production of material in this proposed plant up to press time.

There has been some confusion about a Washington announcement last August, stating that an unfilled capacity in the amount of $993 million was still existent in the expansion plan for plastics. The total expenditure planned to meet the programmed capacity deemed necessary by 1955 is $2.52 billion above the amount that was existent in actual capacity on Jan. 1, 1951. Thus only an expansion of $1.53 billion had been accounted for by Certificates of Necessity.

However, there has been no great rush of applicants to take up the difference. Perhaps the early 1952 slump deterred possible applicants and possibly there is a feeling that the capacity already accounted for is sufficient. Whatever the reason, NPA seems happy that only a few applicants showed up. In the first place, accounting procedure makes the difference look bigger than it is; secondly, some expansion included in the $2½ billion program is not included in certificates—that is, some companies will expand without asking for a certificate; third, the estimated figures for production capacity before the new program was initiated are thought to be lower than the original estimate, thus meaning that so much additional capacity may not be needed; fourth, the Government wants "to have money in the bank" in case last-minute expansion is deemed necessary to meet the demand for any change in the situation that might be caused by an emergency.

There is some indication that some of the projects authorized to receive a certificate will never be started. There are those who insist that some of the phenol and vinyl choride plants, for example, will not be started for some years to come. Supposedly, each plant must be started six months after date of certification, but extensions are granted if construction has been held up by a legitimate problem, or if estimates have been out of line with costs. However, if no good reason is shown for delay, the Government reserves the right to cancel the certificate and grant another to some other company. Companies with less than a $1 million certificate need show good faith by starting one building only—others must have every building in their project started or else they must apply for an extension of time.

There were several serious errors in the text accompanying our last printed list of certificates. The vinyl chloride capacity was listed at between 800 and 900 million lb. by 1955. That figure includes all vinyls, such as saran, polyvinyl acetate, polyvinyl alcohol, and others. Vinyl

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Whitney Blake Co. Hamden, New Haven, Conn.	Field wire for Signal Corps	$250,000	35
Allied Chemical & Dye Corp. New York, N. Y.	Nylon yarn	23,165,000	40
Philadelphia, Pa.	Phthalate esters	818,490	45
Tonawanda, N. Y.	Coal tar chemicals	375,000	50
E. I. du Pont de Nemours & Co. Seaford, Del.	Nylon yarn	6,453,000	40
Martinsville, Va.	Nylon yarn	13,764,000	40
Chattanooga, Tenn.	Nylon yarn	22,426,000	40
Niagara Falls, N. Y.	Adiponitrile	5,170,000	45
Belle, W. Va.	Adipic acid & hexamethylene diamine	1,630,000	45
Victoria, Texas	Adiponitrile	33,475,000	45
Orange, Texas	Adipic acid & hexamethylene diamine	4,549,000	45
U. S. Steel Co. Clairton, Pa.	Coke & coal chemicals	15,070,000	45
Lorain, Ohio	Metallurgical coke	6,103,000	50
Cleveland, Ohio	Coke & coal chemicals	1,760,000	45
Publicker Industries, Inc. Eddington, Pa.	Butadiene	4,309,060	60
Pittsburgh Coke & Chemical Co. Neville Island, Pa.	Acid esters	60,000	45
Delaware River Steel Corp. New Castle County, Del.	Coke, coke by-products	41,500,000	85
Tennessee Eastman Co. Kingsport, Tenn.	Cellulose esters for photographic film & molding composition	4,481,000	45
Kingsport, Tenn.	Cellulose esters for photographic & X-ray film	1,135,426	45
Wood Conversion Co. Cloquet, Minn.	Wood fiber products	520,225	40
Cannon Electric Co. Los Angeles, Calif.	Electric connectors for aircraft	192,084	65
Weyerhaeuser Timber Co. Snoqualmie Falls, Wash.	Wood fiber from mill waste	650,000	40
Klamath Falls, Oreg.	Wood fiber products	1,907,910	40
Union Carbide & Carbon Corp. Bound Brook, N. J.	Polyester resins	349,600	60
Carbide & Carbon Chemicals Co. Div., South Charleston, W. Va.	Polyethylene	1,405,700	60
Institute, W. Va.	Ethyl acrylate & ammonium sulphate	476,000	45
Bakelite Co. Oper. Div. Bound Brook, N. J.	Polystyrene resin compounds	1,536,250	45
Halocarbon Products Corp. North Bergen, N. J.	Halocarbon oils	41,700	60
Jamestown Finishing Products, Inc. Jamestown, N. Y.	Fiberglass cloth	81,437	60
Figlass, Inc. Belmont County, Ohio	Fibrous glass	1,311,000	65
Rostone Corp. Spencer, Ind.	Plastic molded parts for electric control equipment	90,418	45
Pittsburgh Plate Glass Co. Shelbyville, Ind.	Fibrous glass	5,050,000	55
Owens-Corning-Fiberglas Corp. Santa Clara, Calif.	Fibrous glass	1,119,500	65
Behr-Manning Corp. Watervliet, N. Y.	Coated abrasives	734,100	55
Pittsburgh Steel Co. Monessen, Pa.	Metallurgical coke & coal chemicals	11,240,000	85
Monsanto Chemical Co. Everett, Mass.	Phthalate esters	2,207,800	45
St. Louis, Mo.	Tricresyl phosphate	780,000	45
B. F. Goodrich Chemical Co. Louisville, Ky.	Nitrile synthetic rubber	163,000	65
Taylor Fibre Co. Betzwood, Pa.	Vulcanized fibre	218,000	40
Plastoid Corp. Hamburg, N. J.	Plastic insulated wire	23,160 52,295	65 65
American Cyanamid Co. Avondale, La.	Urea	7,500,000	45
Stokes Molded Products, Inc. Yardley, Pa.	Plastic separators for military type batteries	1,549,000	60
H. P. Smith Paper Co. Chicago, Ill.	Military barrier packaging material	270,000	65

chloride will be around 700 million pounds. The polystyrene figure for 1955 capacity was listed as between 800 and 900 thousand pounds. The word "thousand" should have been "million." The list of companies planning to produce or enlarge capacity for vinyl acetate, vinyl alcohol, or both, should have included Dewey & Almy Chemical Co. and Colton Chemical Co., as well as Shawinigan Products Corp., American Monomer Corp., and National Starch Products, Inc. E. I. du Pont de Nemours & Co., Inc., and Union Carbide and Carbon Corp. are the old timers in this program—the former company is a producer of both materials and the latter firm is a producer of vinyl acetate.

Paper Coating Method

ANNOUNCEMENT of a new process for coating paperboard from 2 to 70 mils thick with almost any type resin has been made by Irvington Varnish and Insulator Co., Cap-Seal Div., 500 Doremus Ave., Newark, N. J. The product derived from this method would do the same job as film laminated to paperboard but is believed to be 20 to 25% less costly. For example, the machine used in this method lays down a film of almost any desired thickness on paperboard, saves the cost of an adhesive, and reduces the processing cost generally encountered in laminating film to paper.

Any paperboard from 2 to 70 mils in thickness can be processed, provided that it is flexible enough for rewinding. Kraft and offset papers are the types with which most of the experimental work has been done. But any paper that has sufficient strength to be handled in web form can be used. It would also be possible to coat another film, such as spreading a layer of saran on a 2-mil or heavier vinyl web. Another variation could be coating foil with a plastic resin, provided that the foil has a thickness of 2 mils or greater. Even asbestos could be coated with a plastics film on this processing equipment.

This is a much faster and more versatile coating method than that used in coating paper for multi-wall bags. The rate of operation approaches speeds obtained by calendering. The material to be coated must be fed from a continuous roll. Consequently, it would be impracti-

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packages made of STYRON

During October, which is National Dairy Month, as well as all year around, much interest is centered on the dairy industry. Its high-geared promotions have stressed better packaging and the utmost in protection. Packages made of Styron (Dow Polystyrene), for example, have been used not only to give outstanding protection but to add sales appeal on retail counters. These packages are self-selling salesmen with unusual clarity, eye-appeal and buy-appeal. In the dairy field, moisture resistance of Styron keeps cheese fresh and flavorful—and affords lasting protection.

Let these packaging advantages be yours today. Why not *work together* with experts from Dow's Plastics Technical Service and an experienced molder to give *your* packages harder sell at the point-of-sale?

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Dow Chemical of Canada, Limited, Toronto, Canada

DID *you know?*

That the epicurean flavor and aroma of Camembert cheese is caused by the presence of the blue mold *penicillium camemberti*? When a cheese manufacturer protected the soft delicacy of Camembert cheese with gleaming, rigid polystyrene packaging—*at a price nearly 10% higher*—sales skyrocketed over six times. Once reserved for the gourmet, over 30,000,000 wedges of Camembert cheese were devoured in the U. S. last year!

When mass production molding methods were first introduced to the plastics industry, a machine could produce a three-ounce finished part . . . or 100 pounds of products per day. A recently developed machine can consume up to 300 ounces of polystyrene at once . . . or mold 5,000 pounds of finished parts per day. In less than two decades, a machine capacity increase of 4900%.

DOW *plastics*

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cal to handle small orders of only a few hundred feet. Widths up to 45 in. will be available.

The resin is applied by either an emulsion or solvent system. Cellulosics, vinyls, polystyrene, polyethylene, saran, and possibly urea and melamine can be used. Phenolics are not deemed practical for use on this equipment because the coating material must dry quickly in order to be rewound at the end of the operation.

The end use market for material produced on this equipment is now under study and Irvington is soliciting queries. Varied packaging uses, such as in frozen food, anti-grease boards for doughnut and potato chip containers, and lay-flat paper milk bottles are suggested. A tobacco package of one thickness instead of those that now contain three thicknesses—inner paper liner, cardboard, and outside wrapper—would be possible. Scores of packaging possibilities may open up, but the developers expect this product to go far beyond packaging. Pipe wrap made from paperboard coated with an impervious resin is an almost definite market of the future for this material. Paperboard coated with cellulosic material and compression molded into paper plates is a market already begun. It is possible that a coated sheet would be ideal for vacuum molding, thus making it suitable for advertising signs, maps, novelties, trays, and all kinds of low cost, moldable products. Only a bit of imagination is necessary to foresee many products that could take advantage of this low-cost processing pattern.

Irvington spokesmen make it clear that they are custom coaters for this process and are soliciting orders from customers who have prospective uses for this type of material.

Gel Lacquer

TOWARD the end of World War II, Tennessee Eastman introduced a cellulosic gel lacquer coating, about which little was heard until recently. Now, a paper read by Fred M. Ball of Tennessee Eastman at a meeting held by the American Society in Atlantic City has revived interest in this material. The improved butyrate lacquer used with a new primer prevents any possible danger of air bubbles. The material is now being used on cooling tower fan blades.

In his paper, Mr. Ball stated that a highly glossy film up to 25 times as thick as ordinary enamel can be applied to wooden articles by dipping them in a gel lacquer made from the new finish. It is claimed that brushing or spraying techniques could also be used, as well as dipping.

Inlay Process

DEVELOPMENT of a new plastics inlay process for vinyl film and coated fabrics, claimed to be different than anything now in production, has been announced by the Plastics Div. of Goodall Fabrics, Inc., 525 Madison Ave., New York, N.Y. Ever since the origin of vinyl film and coated fabrics, the industry has been striving for new effects in finishing. The first step was embossed effects designed to simulate fabric weaves, but limited by the fact that only a one-color effect could be obtained. The second step was the combining of a print with embossing to give more of a fabric look. In such cases, however, the embossing was seldom in register with the print pattern.

By the new inlay process, color is fused into an embossed pattern in perfect registration to give actual fabric effects. It will even be possible to duplicate many more types of fabrics, and to create fabric designs which cannot be obtained on a loom.

Pearlescent Finish

DEVELOPMENT of a new natural pearlescent finish for plastics has been announced by Bee Chemical Co. Its principal application will be on kitchen electric appliances. The company claims that this is the first time a natural pearlescent finish has been produced for plastics which would pass the standard "Scotch Tape" test to show adhesion; would withstand prolonged exposure to moisture, ultra-violet light, and abrasion; and would not chip or grow brittle with age.

The finish will be available in various bases to coat polystyrene, acrylic, acetate, and butyrate plastics. It may be applied to either the surface of colored polystyrene, acrylic, or other plastic parts, or to the reverse side of clear plastic parts.

The decorative effect is tantamount to a soft, sparkling, metallic finish. The pearlescent coating is particularly effective in white or pastel colors and imparts a soft yet striking effect unobtainable with metallics in these light shades.

Samples of the new pearlescent finish in various colors are available to manufacturers from Bee Chemical Co., 13799 South Avenue "O," Chicago 33, Ill.

Carpets for Airplanes

JET aircraft used by the Marine Corps will have a carpeted air strip for landings and take-offs, made from a specially processed duck material by the Textileather Corp., Toledo, Ohio.

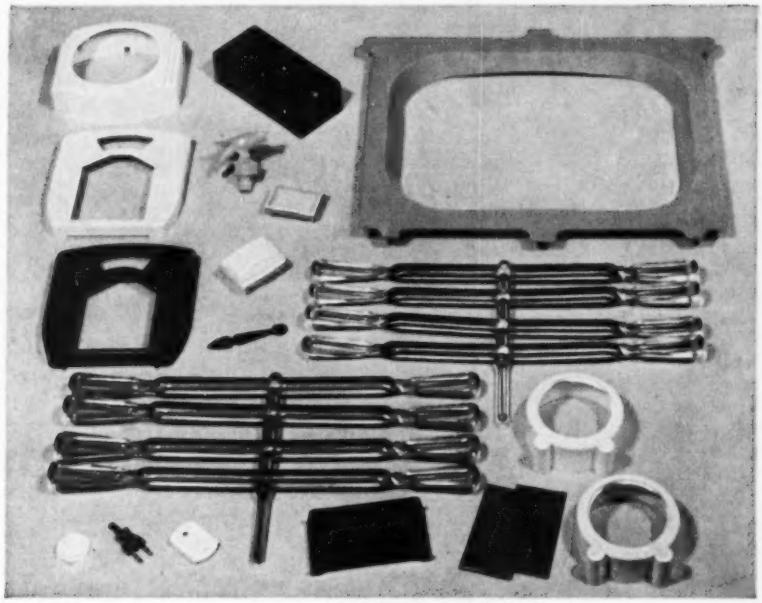
The carpet, which is reportedly processed with vinyl resin, will be placed beneath steel or aluminum landing mats to hold down dust. It will also be impervious to fuels and chemicals used around jets, as well as flame resistant.

Textileather has also introduced a new line of lightweight seat cover trim known as Tolex 18219. The company states that it is a vinyl supported plastic and is also suitable for lightweight furniture upholstery. The material is 54 in. wide.

A further announcement by the company concerns the availability of a new sound and color film, "This is Textileather," which is designed to acquaint its employees and consumers with the end uses of their products. The film shows various operations in the production of spread and calender coated products and how these finished products are used by the consumer.

New Series of Vinyl Polymers

INTRODUCTION of the first in a new series of Pliovic polyvinyl chloride resins, designated Pliovic G90V, was recently announced by the Chemical Div. of Goodyear Tire & Rubber Co. The new material has



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an approximate intrinsic viscosity of 0.90. Not only is it claimed to have excellent light stability for calendering, but it is also suitable for extruding, injection molding, and all other methods in which vinyl is generally used. Other merits listed by H. R. Thies, manager of the division, include a high bulk density for ease of handling and easy interchangeability with other resins.

Goodyear was formerly limited in the production of resin and latex to the copolymer category, but is now introducing this new line of polyvinyl chloride resins as an indication of further activity in the expanding vinyl market.

Fluorocarbon Belts

CONVEYOR belting, made from Teflon coated glass fabrics, is now being produced by the Fabrics Div. of Du Pont. Voss Belting & Specialty Co., 5649 N. Ravenswood Ave., Chicago, was appointed the first distributor of the material.

The Voss Co., established 18 years ago, is well-known to those industries where specialized belts are needed for various purposes.

Anniversary Celebration

ONE hundred twenty-five years ago, a shop was started in New Brunswick, N.J., to make shoe lasts. That small operation has now become the John Waldron Corp., well-known manufacturers of equipment used in the paper-making, textile, floor covering, rubber, and plastics industries. A feature of the company's celebration of the event will be the construction of a new laboratory that will permit installation of testing facilities for the entire converting industry.

Some of the outstanding Waldron "firsts" for the plastics industry have been the Microjet Coater which features improvements in the air knife principle of coating; the Reverse Roll Coater; the Diatron Coater; the Waldron Web Guide which has become almost standard equipment throughout the converting industry; film casting equipment; the new Ecco two-side roll coater designed for coating one or both sides of many types of materials and for lamination of multiple webs; and a specially designed printing machine for plastic film and sheeting.

Reinforced Sheet

AVAILABILITY of fibrous glass reinforced plastics sheets 36 by 72 in. for use as electrical insulation, table tops, wall panels, and other miscellaneous applications has been announced by The Dynakon Corp., 5509 Hough Ave., Cleveland, Ohio. The sheets have unusual strength-weight ratio, as well as excellent chemical resistance and low-water absorption.

The sheets can be obtained in thicknesses up to 1½ inches. Reinforcements are glass cloth, glass mat, fiber, and paper. A variety of colors is also available, according to specification.

Vinyl Rainwear

SALES of the Almar Mfg. Co.'s vinyl raincoats, known as Wat-A-Kotes, have increased by one-half million units during the first half of 1952, according to Harry Weitzner, vice president and director of sales for Almar in Washington, Ga., and New York City. He points out that improved methods have eliminated sewing in assembling the rainwear, and that electronic heat sealing and high-quality styling are responsible for the company's growth.

Established late in 1946, Almar has now built its fourth new modern 35,000 sq. ft. plant at its Washington manufacturing center. The company's present production goal is four million raincoats a year. It is reported that 2½ million lb. of plastic compounds are presently being used annually.

Southwest Molder's Anniversary

ONLY two years ago, Loma Plastics, Inc. of Fort Worth, Texas, entered the plastics housewares field. Now it is one of the five leading companies in this branch of the plastics industry. In celebration of its second anniversary in September, all dealers and jobbers were invited to tour Loma's recently enlarged factory of 40,000 sq. ft., which is located on a 2½ acre lot at 3000 Pafford St., Fort Worth.

The company entered the plastics field five years ago and is now reported to be the largest injection molding plant in the South. During the last year, the company's volume had doubled, and this year it is expected to pass the million dollar mark on housewares alone.

PERSONAL

Mario J. Petretti has been named manager of the **Plastics Div., Camfield Mfg. Co.**, Grand Haven, Mich. Former national president of S.P.E., he has been closely connected with the plastics industry since 1934.

Arthur S. White has been appointed field representative in the Kansas City area for the new **Fiber Glass Div., Libbey-Owens-Ford Glass Co.** With headquarters in the Dwight Bldg., 1004 Baltimore St., Mr. White will work closely with aviation, electrical, industrial insulation, and refrigeration industries, as well as with textile outlets for fibrous glass.

Robert Marsh recently joined the **Durez Plastics & Chemicals, Inc., Molding Compound Sales Div.**, and will make his headquarters at 503 Stephenson Bldg., Detroit 1, Mich.

William J. Kingsley is the new assistant general sales manager of **The Carborundum Co.**, Niagara Falls, N. Y. Mr. Kingsley joined the Sales Engineering Dept. of Carborundum in 1922.

Charles F. Dangelmajer has joined the **Industrial Products Div.** of **Hess, Goldsmith & Co., Inc.**, 1400 Broadway, New York, N. Y. He will specialize in the sales and development of industrial glass fabrics. Mr. Dangelmajer was with American Cyanamid Co. for several years and has long held a leading role in the development of the glass reinforced materials.

A. Donald McGrath, Hartford, Conn., has been appointed Eastern representative of **Wilson Plastics,** Sandusky, Ohio. The company is the producer of Wilson Lockback plastic wall tile.

Hans E. Buecken has been named plant manager and product development engineer for **Extruders, Inc.,** Hawthorne, Calif. He had been with

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National Rubber Machinery Co. since 1939, where he designed and developed equipment for screw extrusion of thermoplastics on an industrial scale. Mr. Buecken had been in charge of design, development, and sales for National Rubber Plastics Machinery Div. since 1946.

T. C. Keeling, Jr., assistant vice president and chemical division sales manager of **Koppers Co., Inc.,** has become deputy director of the Chemical Div. of the National Production Authority at Washington, D. C., at the request of Director George E. Holbrook. A native of Baton Rouge, La., Mr. Keeling became chief of the chemical section of the Army Service Forces in 1942. In November 1945, he joined Koppers as sales manager of the Tar and Chemical Div., and became sales manager of the Chemical Div. in August 1946. During his absence at Koppers, his duties will be performed by C. H. Pottenger, who is now assistant sales manager of the division.

Jackson D. Leonard, a chemical engineer from Metuchen, N. J., has joined **R. S. Aries & Assoc.** as senior associate. His early industrial years were spent with General Chemical Co., Merck & Co., and at a number of plant locations with Du Pont.

Samuel Silberkraus, Riverdale Plastics Development Corp., Jersey City, N. J., will soon embark on a six weeks' tour through Europe and the Middle East. He will investigate plastic developments there, and also supervise the installation of a compression molding plant in the Middle East.

S. J. Rose was recently appointed by **Spraylat Corp.,** 1 Park Ave., New York, N. Y., to supervise the company's St. Louis plant and sales territory. He will specialize in Spraylat's products dealing with strippable, protective coating compounds. Mr. Rose was formerly connected with National Starch Products, Inc.

Russel V. Mills is now field engineer in the East Boston, Mass. territory for **The Bellows Co.,** Akron, Ohio. His headquarters will be at 307 United Bldg., 43 Leon St., Boston. The company manufactures "Controlled-Air-Power" devices.

Edward T. Armstrong recently joined **Toscony Fabrics, Inc.,** 303 Fifth Ave., New York, N. Y., as works manager. Mr. Armstrong has been a research administrator at Battelle Memorial Institute, Columbus, Ohio for the past ten years.

T. J. Kinsella, who has been in charge of the **Barrett Div., Allied Chemical & Dye Corp.,** New York, N. Y. as executive vice president, is now president of that division. Mr. Kinsella came to Barrett in 1947, prior to which he was price executive of the Industrial Machinery Branch, Office of Price Administration, as well as OPA representative on the War Procurement Policy Board, for six years.

COMPANY NOTES

Bakelite Co., Div. Union Carbide & Carbon Corp., has formed a new sales unit under the name of Bonding Materials Dept., with **J. L. Rodgers,** formerly associated with the National Production Authority in Washington, as manager. The sales unit will be responsible for the operations of two long-established divisions which will remain under the names of **Bonding Materials Div.** and the **Adhesives and Laminating Materials Div. Harry Carlson** will continue as manager of the latter and **E. H. Gross** as manager of the former.

Argus Chemical Laboratory, 633 Court St., Brooklyn, N. Y., has appointed **Philip Brothers Chemicals, Inc.,** 176 Federal St., Boston, sales agents in New England for Argus Mark Stabilizers and Vinylum Metallic Pastes.

M. W. Kellogg Co., Jersey City, N. J., recently announced that **Carmen R. Giannotta** has joined its technical staff in the Chemical Manufacturing Div. Mr. Giannotta, formerly supervisor of the plastics laboratory of Eastman Kodak Co., has been active in the plastics field for the past ten years.

Gries Reproducer Corp., 780 E. 133 St., New York 54, N. Y., recently announced the appointment of **A. P. Metzger** of Perrine, Fla., to represent the company in that state. Gries manufactures fastenings, nuts, rivets, and other small parts for plastics moldings.

F. J. Stokes Co. has established a new district office at 2904 Woodburn St., Cincinnati, Ohio. The office will serve users of Stokes equipment in southern Ohio, southern Indiana, all of Kentucky and West Virginia, except the Panhandle. It will be under the supervision of **M. S. Adler,** Cleveland manager, and in immediate charge of **Theodore G. Debreceni.**

The Carborundum Co., Niagara Falls, N. Y., has elected Harry C. Martin, director of research and development, as a vice president of the company. Mr. Martin will, however, continue active direction of the company's research and development activities. His career since joining the research laboratory in 1913 is descriptive of Carborundum's progress. For example, he had an important part in the development of the company's silicon metal castings; cold molded resin bonded abrasive wheels; waterproof paper and electro-coated abrasive paper; and resin bonded fiber disks used for finishing sheet metal parts.

Carborundum has also appointed **Fred W. Scott, Jr.** manager of a newly established **Merchandising Sales Div.** The division was created because of increased activity in the company's retail field. The products to be handled are bonded and coated products; waterproof papers and cloths; flint paper and emery cloth products; sander disks; masking tapes and accessories; adhesives and sealers; and floor paper. Mr. Scott has been with the company since 1938.

Gustin-Bacon Mfg. Co., Kansas City, Mo., has appointed **Edward A. McCabe** manager of its New York Div. Mr. McCabe, who resides in Yonkers, N. Y., will be in charge of all glass fiber insulation, industrial, and railroad division sales in New England, New York, New Jersey, Pennsylvania, and Delaware.

Plaskon Div., Libbey-Owens-Ford Glass Co., has announced that **James N. Grove** is now sales representative of its New York City office for poly-

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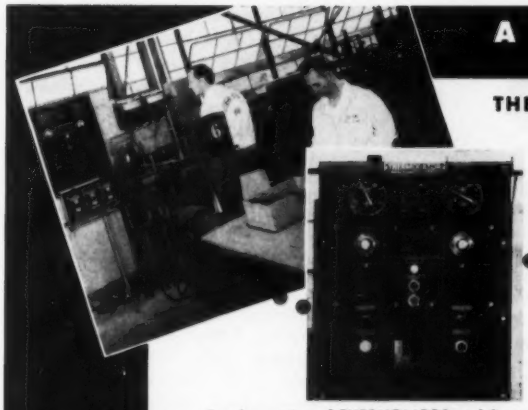

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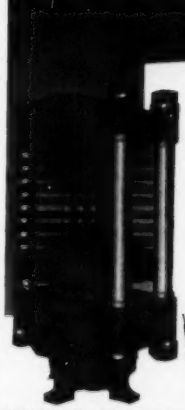

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ester resins and L.O.F. Fiber Glass. Mr. Groves was formerly associated with Marco Chemicals, Inc.

B. F. Goodrich Chemical Co. has opened a new field sales office at 1339 Chestnut St, Philadelphia, Pa. **E. B. Osborne** and **R. L. Lundquist** will handle sales and service on Geon polyvinyl materials, and **P. C. Cramers** will handle Hycar rubber.

Thermaflow Chemical Corp., Tunkhannock, Pa., has been formed to produce a polyester resin molding compound, which was jointly developed by **Owens-Corning Fiberglas** and **Atlas Powder Co.** Since neither of these two companies wished to manufacture a finished molding compound, the project was undertaken by Thermaflow. **Richard F. Doyne** and **James L. Harvey**, formerly connected with the Atlas Powder Co., are president and vice president, respectively.

Synthane Corp., Oaks, Pa., recently announced that **William J. Evert** has been added to the sales staff in their New York office and will handle accounts in the New York State, Long Island, and Brooklyn areas.

Pittsburgh Plate Glass Co. has appointed **John V. Schweppe** production superintendent at the Shelbyville, Ind., Fiber Glass plant.

Plax Corp., Hartford, Conn., has made the following appointments: **Andrew J. Arcell**, sales service manager at the company's West Hartford headquarters; **Russell E. Ames**, sales engineer in the Philadelphia office, 1302 Western Savings Fund Bldg., Broad and Chestnut Streets. Both men have been connected with Plax for several years.

Avery Adhesive Label Corp., Monrovia, Calif., announces the addition of the following six new managerial positions: **C. J. Lee**, field sales manager, will supervise the entire U. S. field operation from his Chicago office; **R. W. Morris**, in his position as specialty sales manager, will expand Avery's line of Kum-Kleen pressure-sensitive labels by developing new uses and new markets; **H. C. Kirby**, re-sale sales manager, will handle all consumer outlets at wholesale and retail levels; **Wayne G. Proper**, factory service manager, will be in charge of all home factory services and head the company's Factory Service Representative system; **Ted Hallberg**, export manager, will supervise Avery label sales outside the U. S.; **J. Malcom Dunn**, as merchandising manager, will develop new sales tools, promotional material, and direct mail advertising.

American Resinous and American Polymer Corporations, Peabody, Mass., have appointed **Orville H. Heinicke** and **F. L. Sutton** to their technical sales staff. Mr. Heinicke will represent American Resinous and American Polymer in Ohio, calling on the paint, rubber, textile, chemical, and other industries. Mr. Sutton will cover Connecticut and metropolitan New York.

A. Bamberger Corp., and its affiliate, **American Molding Powder and Chemical Corp.**, 703 Bedford Ave., Brooklyn, N. Y. has established a branch office at 8 East Long St., Columbus, Ohio.

Tennessee Eastman Co., Kingsport, Tenn., announces the following changes in its personnel: **Guy A. Kirton** is now assistant sales manager of the company's **Chemical Sales Div.** in Kingsport. Mr. Kirton has been in charge of the division's New York City sales offices for the past six years. **Robert H. Cannon**, from the chemical sales offices in Chicago, will take over Mr. Kirton's duties in New York. **Decatur B. Campbell**, the company's industrial chemicals representative in Cleveland, will become supervisor of the chemical sales offices in Chicago, and will be replaced in Cleveland by **John A. Sanders**, from the New York staff. **Rawlings Hargrave** will be transferred from Eastman's chemical sales development group in Kingsport to the New York staff.

Clopay Corp., Cincinnati, Ohio, announces the following additions to its laboratory staff: **Alfred L. Alk**, assistant technical director; **Wesley Shookevich, Sr.**, research chemist; **Charles McCracken, Jr.**, staff mathematician; **Eva Pauson**, **Robert Mauldin**, and **Paul Ames** have assumed duties as junior research chemists.

Sundberg-Ferar, industrial designers, has moved to larger headquarters at 1204-10 S. Woodward Ave., Royal Oak, Mich. Mailing address is P. O. Box 104, Ferndale 20, Mich.

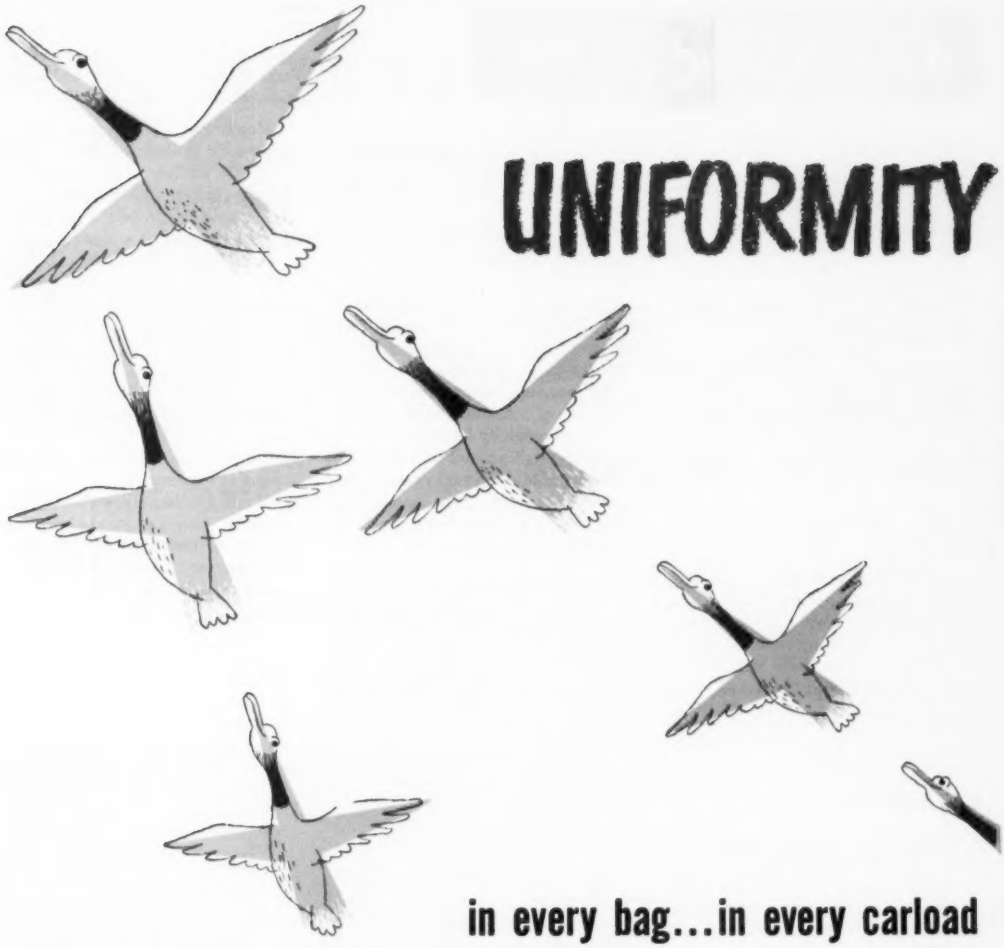
Monsanto Chemical Co. has appointed **Alfred P. Daignault** and **Anatole Lucas** thermoplastics sales representatives, with headquarters in Detroit, Mich. Both men joined the company early this year to train for their new positions.

Baker Castor Oil Co., 120 Broadway, New York, N. Y., recently named Frank Walsh its sales representative for the middle Atlantic regions, covering Pennsylvania, Delaware, Virginia, Maryland, and the Carolinas. His headquarters will be in Philadelphia. Mr. Walsh was formerly with Merck & Co., Inc.

Sindar Corp., 330 W. 42 St., New York, N. Y., has announced the appointment of **Leonard Stoller** as advertising manager.

Firestone Plastics Co. appointed **Kenneth L. Edgar** sales manager of Velon products. He succeeds Elmer French, former vice president in charge of sales, who resigned. Mr. Edgar joined the company as a chemical engineer in the general laboratories. During the war years, he headed up a development section on non-metallic bullet-sealing fuel cells. In 1945 he was one of the first to join the newly formed vinyl sheeting division of the Firestone Industrial Products Co., out of which grew the Firestone Plastics Co. One year later he became the company's film representative in the New York and New England area. In 1948 he was made manager of Velon Film Sales. Early this year Mr. Edgar was appointed manager of the **Velon Sheetings Div.** He will make his headquarters at Pottstown, Pa.

Midland Plastic Molding Co. has completely separated from its associate company, **Wilson Plastics, Inc.**, Sandusky, Ohio, and moved into a modern and enlarged plant at 310 Boalt St., Sandusky. **Larry K. Peabody** will head the new company as



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INDUSTRIAL CHEMICALS DIVISION, DEPT. MP11
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In Canada: North American Cyanamid Limited, Toronto and Montreal

PLASTISCOPE

president and **Jack Sampson**, formerly of Wilson Plastics, will be sales manager. The new company will concentrate on production of Econ-O-Tile polystyrene wall tile, and has announced a 20% price cut. Wilson Plastics, which formerly produced both Econ-O-Tile and Lockback plastic wall tile, will now produce Lockback tile only.

Dealers Service & Supply Co., 8440 St. Charles Rd., St. Louis, Mo., has been named distributor of Alsynite by the **Alsynite Co. of America**, San Diego, Calif. Alsynite is a polyester-fibrous glass translucent plastic sheeting which is used in a wide variety of structural and decorative applications.

Columbia Protektosite Co., Inc., Carlstadt, N. J., a subsidiary of the **Curtiss-Wright Corp.**, has appointed **Herman P. Glatt** director of sales. Mr. Glatt was formerly vice president of Federal Seat Corp. and sales executive of Eversharp, Inc. **William A. Bloch**, formerly with Eversharp, will assist Mr. Glatt.

EXPANSION

Bakelite Co., Div. of Union Carbide and Carbon Corp., has announced that its new phenol plant at Marietta, Ohio, will increase its national production capacity by one fourth. Production capacity at the new plant will be 60 million lb. a year. Officials of the company at various times have stated that they do not expect even this quantity to be sufficient to supply their own ever-increasing demands for phenol. This is especially true for phenolic resins, which it is assumed will continue to expand for use in foundry molds, wood aggregate cores, honeycomb structures, and large size mold pieces. Prominently included in the new plant's equipment is a large quantity of glass fiber mat which is impregnated with Bakelite phenolic resin and used as insulation around various ducts.

Celomat Corp., 521 West 23 St., New York, N. Y., has expanded their facilities for custom operations in vacuum forming of rigid thermoplastic sheet. One of the new items is a press capable of vacuum forming pieces up to 60 in. long and 33 in. wide.

Taylor Fibre Co., Norristown, Pa., and La Verne, Calif., has begun construction of a plant addition to increase facilities for the manufacture of vulcanized fiber. Merritt H. Taylor president of the company, stated that the new plant is part of a program announced by the Defense Production Administration. This would increase by 10 million lb. the existing total annual output of 60 million pounds. The current project, when completed, will increase by over 20% the total floor space now available at the plant.

W. R. Grace & Co., 60 Beaver St., New York, N. Y., has completed negotiations for a thirty-year $35 million loan. Part of this loan will be used to construct an $18 million ammonia-urea plant at a site not yet disclosed. Further expansion in the petro-chemical field is expected. Among other interests, W. R. Grace & Co. has a financial interest in Dewey & Almy Chemical Co., and owns approximately 20% of the stock of the Davison Chemical Corp.

United States Plywood Corp., 55 West 44th St., New York, N. Y., is in the process of completing a plant which will increase production of Novoply by 70 percent. Novoply is a so-called resin bonded waste-wood, generally called hard board in the trade. The company states that although their volume of fir plywood is increasing, it will gradually become a less important part of their operation due to mounting sales of other types of plywood and various other products.

Yardley Plastics of Canada, Ltd., an affiliate of Yardley Plastics Co., Columbus, Ohio, is investing $110,000 in new plant expansion. Plans include a new concrete-block building with 7500 sq. ft. of floor space, to be equipped with extruders and injection molding machines. The principal products will be plastic pipe and fittings, ranging from ½ to 6 in., Miraplas wall tile, and plastic custom molding. The Daymond Co., Ltd., Chatham, Ontario, controls the distribution of Yardley plastic pipe and Miraplas wall tile in Canada and overseas.

Mayflower Electronic Devices, Inc., 6014 Hudson Blvd., West New York, N. J., has constructed a new building where experimental and development work will be performed by the newly organized Mayflower Research Development Co. Although experimental work at present is largely for the Armed Forces, projects are being solicited on a fee basis for civilian work. The business management is in charge of Edward J. Wohlfarth; A. W. Horr is the chief engineer of the mechanical dept.; Raymond Meenen has charge of the electronic coordination with mechanical apparatus.

Mayflower has also announced that John M. Torr has joined its organization in the capacity of national sales director. He was formerly associated with Radio Receptor Co. and Phillips Screw Co.

Deceased

Fred S. Carver, president of Fred S. Carver, Inc., Summit, N. J., died recently, following a short illness. As an inventor, mechanical engineer, and manufacturer, he was well-known for his contributions to the design and development of hydraulic equipment. He was recently honored for his part in the development of equipment for atomic bombs.

The company will continue to operate under the ownership and management of Mr. Carver's sons, William and Robert.

MEETINGS

Dec. 4-5—Society of the Plastics Industry, Fourth Film, Sheeting and Coated Fabrics Div. Conference, Commodore Hotel, New York, N. Y.

Dec. 7-10—American Institute of Chemical Engineers, Annual Meeting, Hotels Cleveland and Carter, Cleveland, Ohio.

S.P.E. Meetings

Nov. 21—A. N. Skeels, Roll Leaf Stamping Co., will speak before the Buffalo Section on "Marking of Plastics and Plastics Products."

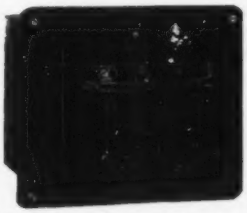
Dec. 19—R. W. Powell, Hydraulic Press Mfg. Co., will address the Buffalo Section on "Preplasticizing."

MORE AND MORE

MOULDERS and EXTRUDERS

Are Demanding *Gardsman*

PRECISION AND DEPENDABILITY



In the complete Taco West line of GARDSMAN temperature controllers there has been no compromise with quality. Only the finest components are used, and every instrument that leaves the factory must pass a rigid inspection and "run-in" period. The Gardsman is outstanding in reliability because the magnetic amplifier which Taco West incorporates in all instruments replaces the electronic tube normally used, and it eliminates all adjustments and tube replacements.

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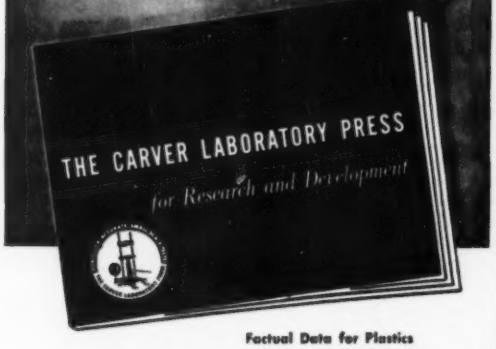

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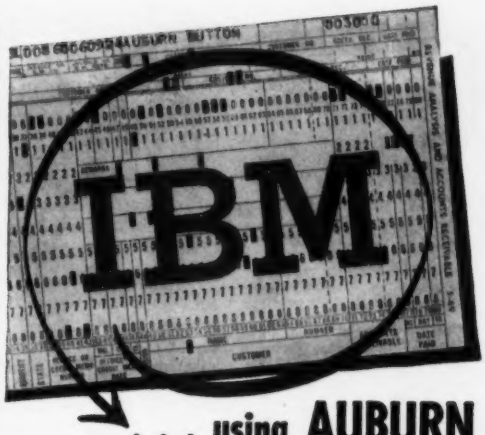


. . . using AUBURN molded plastics for 26 years

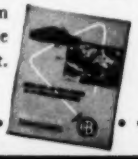
AUBURN BUTTON WORKS had already celebrated its 50th anniversary in 1926 when it received the initial order for compression molded parts from the Tabulating Machine Company of Binghamton, New York, a wholly-owned operating subsidiary of INTERNATIONAL BUSINESS MACHINES CORPORATION.

From that first order, and to the present, Auburn has been a major producer of plastic components for IBM. Today, using processes of injection, transfer and compression molding, extrusion and reinforced plastics, AUBURN supplies custom molded parts for IBM products.

Outstanding versatility in the design and production of plastics to meet both volume and precision specifications explains why many of America's foremost corporations have chosen AUBURN for custom molded plastics.

We at AUBURN have steadily expanded facilities and modernized equipment to remain a leader in plastics. Equipped to mold any material by any modern method, AUBURN maintains high quality control standards.

For the complete story of AUBURN and how it can solve your problem in plastics, plus information on our newest molding facility, vacuum forming of thermoplastic sheets, write today for a free illustrated booklet.



Auburn Button Works, Inc.
600 McMaster Street, Auburn, New York
Founded in 1876 Telephone 3-5320

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EMPLOYMENT • BUSINESS OPPORTUNITIES • EQUIPMENT (used or resale only)

MACHINERY and EQUIPMENT FOR SALE

FOR SALE: Quick delivery Rubber and Plastic Equipment. Farrel 18" x 48", and 12" x 36"; 2 roll rubber mills. New 6" x 12" and 6" x 16" Lab. Mixing Mills and Calenders. Other sizes up to 84". Royle #1 to #3 extruders. Bethlehem 2000 Ton 10 opening press, 5'-6" x 5'-9" heated platens. 200 ton Brunswick 21" x 21" Platens, 14" Ram, Record Presses. W.S. 100 ton 24" x 24", Elmo 75 ton 30" x 36". Also presses Lab. to 2000 tons from 12" x 12" to 48" x 48". Hydr. Oil Pumps. Gould 75 HP motor Dr. 2 stage Centrif. Pump 250# W.P. W.S. 4 Pigr. High and low Pressure Hydr. Pump. HPM 5 GPM 2700 lbs. Elmes Hor. 4 Pigr. 4500 lbs. and 5500 lbs. Hydr. Accumulators. Stokes Automatic Molding Presses. Rotary & Single punch Preform Tablet Machines ½" to 3". Injection Molding Machines 1 oz. to 32 oz. Baker Perkins jacketed mixers 100, 50, 9, & 4½ gals. Plastic Grinders. Heavy duty mixers, grinders, pulverizers, gas boilers, etc. Partial listing. We buy your surplus machinery. STEIN EQUIPMENT CO., 90 West Street, New York 6, N. Y. WOrth 2-5745.

FOR SALE: 50 Ton Stokes Presses & Pump. 200 Ton W.S. Hobbing PRESS, 300 Ton W.S. PRESS 24 x 20 Platen, 175 Ton H.P.M. PRESS 30 x 30 Platen, 150 Ton Farrel PRESS 30 x 30 Elec. Plates. 140 Ton W.S. PRESS 23 x 17 Platens, 85 Ton Stewart Bolling PRESS 20 x 20 Platen, 60 Ton Elmes PRESS with 18 x 18 Elec. Platen, 75 Ton W.S. PRESS 15 x 15 Platen, 75 Ton Adamson PRESS 20 x 20 Platens. Laboratory presses, Accumulators, Piston and Oil Pumps. AARON MACHINERY CO., INC., 45 Crosby St., N.Y.C.

SAVE WITH GUARANTEED REBUILT EQUIPMENT—RUBBER MIXING MILL: heavy duty 16"x48"; HYDRAULIC PRESSES: 28" x25", 750 ton, 18" ram, HOBBING, 26"x18", 12" main ram, TRANSFER, 170 tons; 20"x20", 10" ram 110 tons, 24"x20", 10" ram, 118 tons; 20"x20", 10" ram, 200 tons, 30"x26", 8" ram, 75 tons, 15"x15", 8" ram, 75 tons, 19"x24", 10" ram, 75 tons, 12"x12", 6½" ram, 50 tons, 14"x14", 5" ram, 50 tons, 8"x9½", 4½" ram, 20 tons, 16"x16", 3½" ram, 12 tons; LABORATORY PRESSES: Carver, model 150, 10 ton, Buehler 10"x7" 12 ton; NEW UNIVERSAL DUAL PUMPING UNITS: 3 to 15 HP; NEW LABORATORY MILLS & CALENDERS: EXTRUDERS: Royle 2½" Plastic, insulating type, NRM, 6", strainer type: ACCUMULATOR, HPM 6" ram, 2500#. PREFORM PRESSES all sizes, also Mixers, Vulcanizers, Injection Molding Machines, etc. UNIVERSAL HYDRAULIC MACHINERY CO., INC., 285 Hudson St., New York 13, N.Y.

WE HANDLE HYDRAULIC PRESSES, pumps, and power units of all sizes. Write us your requirements and we will try to help you. We find it impossible to list our equipment in this classified column due to the fact that the equipment is sold before ad is published. For those who seek action look in the New York Times under the Machinery and Tool Column for our regular Sunday Special. HYDRAULIC SAL-PRESS, INC., 386-90 Warren Street, Brooklyn 2, N. Y. MAin 4-7847.

FOR SALE: Thermex Preheater, Model 2P; Airtronics Preheater, Model D E; Airtronics Preheater, Model C B. Like new. AARON MACHINERY CO., INC., WOrth 4-8233, 45 Crosby St., New York 12, N. Y.

FOR SALE: Complete wood flour mill. Capacity 10 tons per 24 hours, using nearby supply of pine and poplar. For further particulars address Box 1102 Modern Plastics.

FOR SALE: Buttondex machines, used but in excellent condition. Reply Box 1108, Modern Plastics.

FOR SALE: Reinforced Plastics Press 54" x 144" Platens. INJECTION PRESSES 16 & 24 oz. Watson, 4, 9 oz. HPM. 22 oz. Impco, 3 oz. vertical Manton, 1 oz. Van Dorn 1—9 oz. HPM cylinder. EXTRUDERS: 2½" oil htd. NRM, 40' conveyor.—2 scrap grinders. Ovens.—3, 12 & 40 tons lab. presses. 150 & 250 tons transfer presses. Preform presses. No. 9 Sheridan embossing press. 42" slitting & rewinding machine. 7½ HP Reliance Varidrive. 3 HP gas boilers. List your surplus equipment with me. JUSTIN ZENNER, 823 Waveland Ave., Chicago 13, Ill.

FOR SALE: 1—Farrell 20" x 48" Plastic Mill, m.d.; 1—Farrell-Birmingham self-contained 6" x 13" 3-roll vertical Calender, m.d.; 1—Royle 2" oil heated Plastics Extruder; 1—Baldwin 200 ton Molding Press; 1—Colton #5½ Preform Press. Also Grinders, Extruders, Compression and Injection Molding Presses, Mixers, etc. Send us your inquiries. We buy your idle Equipment. CONSOLIDATED PRODUCTS CO., 13-14 Park Row, New York 38, N. Y. BArclay 7-0600.

FOR SALE: 1—Ball & Jewell No. 1½ Rotary Cutter, stainless steel. 3—Mikro Pulverizers #1-SH, #2-SI, #2-TH. 2—Kux Rotary Pellet Presses. 6—Stokes Rotary Pellet Presses. Read 600 gal. Jacketed Ribbon Mixer. Large stock stainless steel tanks and kettles. PERRY EQUIPMENT CORP., 1429 N. 6th St., Phila. 22, Pa.

FOR SALE: 200 TON LAKE ERIE high speed semi-automatic transfer molding press, with upstroke duplex cylinder. Self contained Oilgear Type DP-20 pump, 10 HP 220 Volt 3 phase 60 cycle motor. Electrical controls with return and slowdown limit switches; individual pressure controls for both rams; and timers for holding, breather and preheat. Platen 39" wide between rods, 30" wide grids, 24" front to back. 6" Top grids, 8" Bottom grids, 20" daylight between grids. Main ram stroke 14" duplex ram stroke 8". Capacity 200 tons main ram, 20 tons pullback; 50 tons duplex ram; 10 tons pullback. Serial No. 2511. Excellent condition, used intermittently for five years, pump practically new. May be inspected in operation. AUBURN BUTTON WORKS, INC., Auburn, N. Y.

FOR SALE: Dielectric Preheater. Thermal Super Chief Model 5, used only a few hours. Here is an opportunity to purchase a machine with 5 pounds per minute capacity, 670 sq. in. platen area, and 1" to 4" adjusting height at the cost of a smaller machine. Write Box 1107, Modern Plastics for further information.

FOR SALE AT TREMENDOUS SAVINGS: Colton 2 and 3 RP Rotary Tablet Machines. Mikro 18H, 3TH, 4TH Pulverizers; Day Bee and Schutz O'Neill Mills. Baker Perkins & Readco Heavy Duty Steam Jacketed, Double Arm 50, 100, 150 gal. Mixers. Baker Perkins 150 gal. D. A. Unidor Jacketed Mixer. Baker Perkins 100 gal. D. A. Vacuum Mixers. J. H. Day from 3 up to 75 gal. Imperial and Cincinnatus D. A. Jacketed Sigma Blade Mixers. Day & Robinson 100 up to 4000 lbs. Dry Powder Mixers. Pony ML and M Labelrites. Package Machy. FA, FA4, Miller, Hayssen 3-7, Scandia auto. Wrappers. Hudson Sharp Campbell auto cellophane Wrapper. REBUILT AND GUARANTEED. This is only a partial list. Over 5000 machines in stock—available for immediate delivery. Tell us your machinery requirements. UNION STANDARD EQUIPMENT CO., 318-322 Lafayette St., New York 12, N. Y.

FOR SALE: Stokes #200A 10-ton automatic compression press complete, 7 Wheelco Capacitrols, 4 Bristol controllers; also 4300 pounds virgin blue-green Dow Ethocel @ 45¢ pound. WINDMAN BROTHERS, 3325 Union Pacific Ave., Los Angeles 23, Calif.

FOR SALE BY MOLDING FIRM two Reed Prentice eight-ounce machines, one Watson Stillman sixteen-ounce machine. No dealers. Reply Box 1118, Modern Plastics.

MACHINERY and EQUIPMENT WANTED

WANTED: Plastics and Rubber Processing Machinery including Banbury Mixers, Heavy Duty mixers, Calenders, Rubber Rolls & Mixers, Extruders, Grinders & Cutters, Hydraulic Equipment, Rotary and Vacuum Shelf Dryers, Injection Molding Machines. Will consider a set up plant now operating or shut down. When offering give full particulars. P.O. Box 1351, Church Street Sta., New York 8 N. Y.

WANTED: NEW OR USED 2½" or 3½" N.R.M. extruders. Also parts such as cylinders, etc. Reply Box 1104, Modern Plastics.

WANTED: 1 USED REVERSED ROLL COATING MACHINE that will coat up to 54" in width and in thickness from 1 mil upwards. Must be in A-1 condition. Reply Box 1110, Modern Plastics.

ELECTRONIC EQUIPMENT WANTED. Reputable Manufacturing Company, 30 years in business is opening branch to manufacture large Vinyl items. Will purchase your entire facilities or any bar or rotary sealing equipment. Will take over balance of your lease if space is adequate for our production. Will hire your key personnel if available. Will consider all offers for plant, equipment or personnel. Reply Box 1131, Modern Plastics.

WANTED: LATE MODEL INJECTION MOLDING MACHINES 4 oz., 8 oz., 12 oz., 16 oz. Must be in good condition. EVERGLADES MANUFACTURING, 4216 Ponce de Leon Blvd., Coral Gables, Florida.

WILL PAY SPOT CASH for the following size extruders: 2—3½" oil heat; 1—6"; 1—2½", 1—3½". WILLIAM TAPPER, 30 S. Broadway, Yonkers, N. Y.

WANTED—16 ounce HPM or Watson Stillman Injection Molding Machine. Must be late model in good operating condition. Also one scrap grinder 250# per hour capacity. NATIONAL PRODUCTS COMPANY, Kansas City, Missouri.

WANTED BY MOLDER: Injection Machines, 2 ounce to 12 ounce capacities, any condition. State make, age, serial number, condition, and price. Also 2# Cumberland or equivalent scrap grinder. WINDMAN BROTHERS, 3325 Union Pacific Ave., Los Angeles 23, Calif.

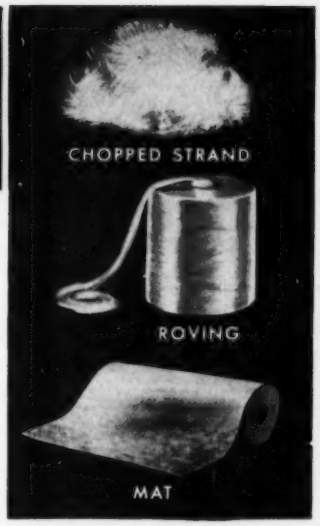
MATERIALS WANTED

WANTED: PLASTIC SCRAP or REJECTS in any form: Cellulose Acetate, Butyrate, Polyethylene, Polystyrene, Vinyl, Acrylic, Ethyl Cellulose. Reply Box 1101, Modern Plastics.

WANTED: PLASTIC Scrap or Rejects in any form. Acetate Butyrate, Polystyrene, Acrylic, Vinyl Polyethylene, etc. Also wanted surplus lots of phenolic and urea molding materials. Custom grinding, magnetizing and compounding. Reply Box 1102, Modern Plastics.

(Continued on page 244)

FIBER GLASS
For reinforced Plastics



Plastic molders can now make use of a new source for high-quality glass fibers, manufactured exclusively for use in the reinforced plastics field.

These fibers are available in chopped strand, roving and mat form to fit your particular application. And to help you in the design and development of your reinforced plastic products, we offer you the facilities of the *largest product development laboratory in the entire fiber glass industry.*

Ferro fiber glass is backed by 30 years' experience in the manufacture of glass . . . experience in producing plastic raw materials for the plastic industry. This combination of skills can be the stepping stone you're looking for in your search for new and better reinforced plastics.

A letter or call today will put our engineers to work on your plastic reinforcing problem.

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Vinyl resin processing experience

This is a once-in-a-lifetime opening for several men with topnotch potentials to join the technical staff of a well-known chemical manufacturer who has recently opened new vinyl resin producing facilities.

The men we want, about 30 years old, should be science graduates and have practical plastics backgrounds which will enable them to specialize in technical service to one of the following:

(1) Extruders, electrical (wirecoating, etc.) and general extrusions (rigid and flexible)

(2) Manufacturers of floortile, floorcoverings, sheeting, film, etc.

(3) Molders and fabricators of vinyls, vinyl plastisols and organisols

These men will relocate (at our expense) to the midwest for a period of approximately six months, after which they will be assigned to one of our district sales offices elsewhere. The startling salary we offer is substantial enough to attract men with genuine ability.

Send all particulars about yourself, including a recent photograph, in your first letter and we will arrange for an interview. All details will be held in strictest confidence.

Write to Box 1100

MODERN PLASTICS MAGAZINE

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CLASSIFIED ADVERTISING

(Continued from page 242)

WANTED: Plastic Scrap, Rigid Vinyl, Cellulose Acetate, Polystyrene, Polyethylene, Butyrate, Custom grinding, magnetizing, compounding, and straining of contaminated plastics. FRANKLIN JEFFREY CORPORATION, 1671 McDonald Avenue, Brooklyn, N. Y., ES 5-7943.

WANTED: Plastic scrap such as Cellulose Acetate, Vinyls, Acrylic, Ethyl Cellulose, Polystyrene, Butyrate, etc. We also buy surplus inventories of molding powder or grind, clean and reprocess your own scrap. CLAUDE P. BAMBERGER, INC., 152 Centre St., Brooklyn 31, N. Y., Tel. Main 5-5553. Not connected with any other firm of similar name.

WANTED: NITRATE SCRAP—.010 plastic scrap in any form, sheets or rolls to as narrow as 1¾" wide. Due to storage and fire restrictions would prefer to buy in quantities of ten to fifty pounds. Address B & J SPECIALTIES CO., 1365 Harrison St., Noblesville, Ind.

MATERIALS FOR SALE

FOR SALE: 3000 pounds Flesh and Pink Butyrate Molding Powder, reground 28 cents per pound. Reply Box 1105, Modern Plastics.

3000 POUNDS UNGROUND OR REGROUND PINK PLASTISOL SCRAP. CLAUDE P. BAMBERGER, INC., 152 Centre Street, Brooklyn, New York. (Not connected with any other firm of similar name.)

FOR SALE: JOB LOT, light transparent Shell acetate molding powder, 10,000 pounds at 35¢ per pound. FRANKLIN JEFFREY CORPORATION, 1671 McDonald Ave., Brooklyn 30, N. Y. ES 5-7943.

MOLDS WANTED

WANTED: BOXES, BOXES—Molded Boxes or Box Molds: We have thousands of clients who are seeking molded Styrene Boxes for packaging. List and send sample of each type box you have available. BRADLEY ASSOCIATES, INC., "world's largest source for molded plastic boxes"—1452 N. Damen Ave., Chicago, Ill.

WANTED USED INJECTION MOLDS for household items to be used from 4 oz. to 16 oz. machines. Kindly send samples in duplicate, quotations and full details to Box 1130, Modern Plastics.

MOLD WANTED for injection molding. We will buy one mold or a complete line or series of molds for finished resaleable items. Housewares, toys, novelties, etc. Will also buy molds for industrial parts such as handles, knobs, drawer pulls, gears. All items for resale in U. S. A. Send detailed information to VICTORY MANUFACTURING COMPANY, 1722 W. Arcade Place, Chicago 12, Illinois.

BRUSH MOLDS & BRUSH MACHINERY wanted for cash. Injection molds for ladies, mens, military, nail, tooth, brushes, etc. Send particulars and samples. Box 47 Realservice, 110 W. 34th St., New York 1, N. Y.

WANTED — INJECTION MOLDS. Midwest molder will buy one mold or several or a complete line of molds suitable for finished items. Prefer housewares, toys, novelties or standard industrial items, all for resale or we will mold for you. Write in detail to POLY-MOLD PLASTICS COMPANY, 3417 North Western Avenue, Chicago 18, Illinois.

FOR EUROPE, INJECTION MOLDS WANTED We will rent on a 3 or 6 month basis, or buy outright, molds for toys, novelties, housewares, or industrial parts. All items to be manufactured and sold in France. Rush samples, mold dimensions, age, number of cavities and price to R. DECAT, Redney Lane, Kings Point, Long Island, New York. We are rated by Dunn and Bradstreet.

INJECTION MOLDS WANTED—Housewares (tumblers, water pitcher, trays, etc.). Combs (5 inch, heavy barber type, etc.). Baby sectional feeding dish and mug, cocktail mixers, desk calendars, banks, hangers, etc. Rental, royalty or outright sale. Send samples, illustrations and mold details to DAVID ROME ASSOCIATES, 350 Fifth Avenue, New York 1, N. Y.

PLANTS FOR SALE

ASSOCIATE WANTED, OR WILL SELL! Sheet plastic manufacturing plant equipped to reclaim scrap plastic or manufacture sheeting from virgin resins. Plant consists of 16" x 40" mill; 5 roll Baker Perkins calender, motor driven; coating machine for manufacture of electrical plastic tape; mixer, boiler, preheater, etc. Chance of a lifetime. Reply Box 1111, Modern Plastics.

HELP WANTED

A MEDIUM-SIZED MANUFACTURER OF PLASTIC-COATED fabric is seeking a working production manager. Practical operating experience necessary. Reply Box 1106, Modern Plastics.

PLANT MANAGER WANTED — Plastic toy plant in Greater Boston has opening for man qualified to take full control of all operations, such as production, personnel, and purchasing. This is a permanent position with a rapidly growing toy manufacturer who offers a good salary and bonus arrangement for the right man. All fringe benefits, insurance, vacations, etc. Give full particulars, experience, and salary expected in your letter. Write BRADFORD NOVELTY CO., 760 Main St., Cambridge 39, Mass.

VINYL SHEETING: Expanding manufacturer looking for capable, ambitious personnel to augment present organization. Printing supervisor with some technical ability, color matcher, vinyl chemist and production men needed. We invite both low and high skilled men to apply. Many benefits. First application must be in writing to L. Milacci, Personnel Manager, KAYE-TEX MANUFACTURING CORPORATION, YARDVILLE, NEW JERSEY.

CHEMIST — Familiar with Polyester and vinyl plastics, possessing ingenuity, and industrious to do development and sales service work in fabricated products. Advise full experience and salary desired. HEIL PROCESS EQUIPMENT CORP., Cleveland 11, Ohio.

MOLDING PLANT SUPERINTENDENT: Man thoroughly trained in operation of injection molding plant using all types of plastic materials. Must have complete knowledge of mold design and construction and be able to direct setting up molds in machines. Unusual opportunity for the right man. Write stating your complete background, qualifications, and salary desired. Reply Box 1113, Modern Plastics.

EXTRUSION ENGINEER: Excellent opportunity for experienced man approximately 30 years old, as a project engineer in rapidly expanding extrusion company. Applicant must be qualified to design and build tools and fixtures for fabrication of extruded sections, design and develop extrusion dies for all thermoplastics, and be of supervisory caliber who could eventually direct the entire activities of the engineering department. Location in progressive midwest city. Reply with complete details as to experience and status. Replies will be held strictly confidential. Box 1115, Modern Plastics.

VINYL CHEMIST—Manufacturer of calendered, coated and extruded vinyls requires experienced vinyl chemist in product development. Excellent opportunity in new plastics division. All replies held confidential. Reply Box 1129, Modern Plastics.

SALESMAN WANTED — by well established firm doing vacuum forming and fabrication of thermoplastic sheet materials. Give all information in first letter. Reply Box 1112, Modern Plastics.

ASSISTANT MANAGER — Injection Molding Plant. Attractive opening available in American-owned, medium sized plant; located Puerto Rico. Must possess experience and ability to set-up conveyor assembly lines, understand spraying and supervise molding. We are interested only in someone capable of developing into plant manager and willing to settle in Puerto Rico. Please state background in detail, salary desired. Write ONLY to President, E. S. LOWE, 27 West 20 Street, New York, N. Y. Replies held in strictest confidence.

ASSISTANT DAY SHIFT FOREMAN wanted for injection molding plant of large manufacturer in Sturgis, Mich. Permanent position with steady advancement for the right man experienced in setting molds and maintaining equipment on Lester machines. ALSO OPENING FOR NIGHT SHIFT FOREMAN to take charge of complete shift in injection molding department. Write full particulars and past earnings. Reply Box 1117, Modern Plastics.

WELL ESTABLISHED Midwestern Proprietary molder has openings for two men in expanding operations. PRESS ROOM PRODUCTION FOREMAN—This opening requires a man with experience in both thermosetting and thermoplastic fabrication; both compression and injection. Opening demands a man with know-how and ability to follow through both actual production and related projects. Would be responsible for efficient operation and results of press room on three shift basis. Extrusion experience would be desirable but not essential. Salary open. PLASTIC PLANT CHEMIST—This opening requires a young chemical engineer with several years experience on both production and laboratory evaluation of plastic materials. Should be capable of supervising the production of molding powders in both thermosetting and thermoplastic types—also maintaining inventories and ordering a large variety and tonnage of plastic materials per month. Experience in extrusion work desirable but not absolutely necessary. Salary open. Send complete details and work record with first application. SWEDISH CRUCIBLE STEEL CO., Plastic Division, E. McElligott, Plant Manager, 8561 Butler Ave., Detroit 11, Mich.

PLASTIC DEVELOPING ENGINEER with managing experience to take charge of the development at a large plastic molding and extrusion plant. Will consider only applicants stating experience, background, etc. in first letter. Reply Box 1123, Modern Plastics.

COATINGS CHEMIST wanted by large eastern manufacturer of industrial chemicals for responsible position in Product Development Dept. encompassing laboratory, advisory and customer contact work. Sound background in chemistry plus substantial experience with paints, lacquers and resins is necessary. Salary liberal depending on experience. Reply fully to Box 1125, Modern Plastics.

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(Continued on page 246)

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CLASSIFIED ADVERTISING

(*Continued from page 244*)

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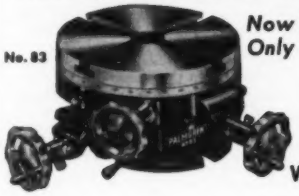

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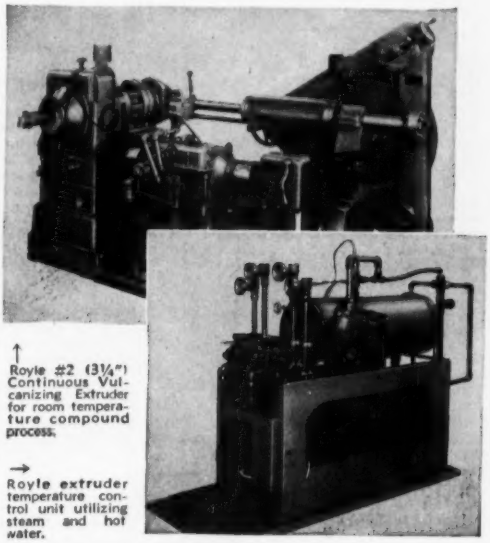

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→ Royle extruder temperature control unit utilizing steam and hot water.

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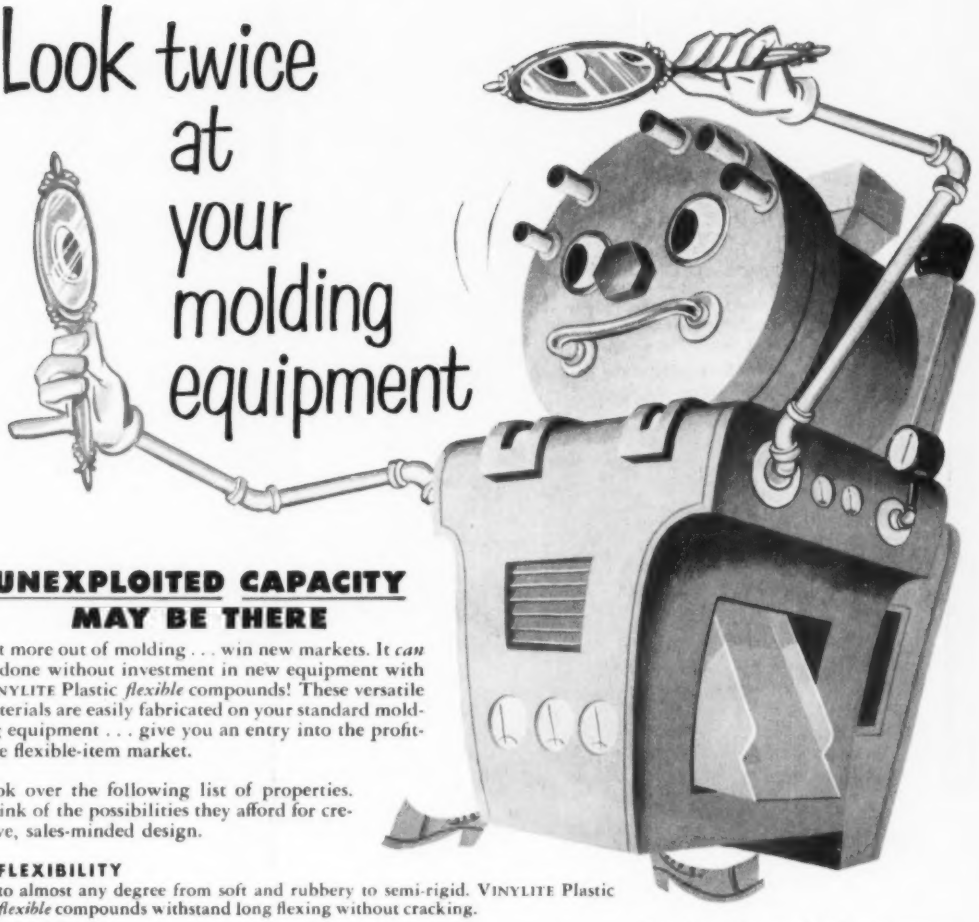

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How would you like to be able to obtain six or eight *different-looking* plastics parts—using only *one* set of molds?

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This example is typical of the way General Electric's *complete* molding service can help you cut costs in obtaining the plastics parts you need. G.E., one of the world's largest plastics molders, offers you not only tremendous molding facilities but the creative engineering and impartial material choice that can mean low-cost, high-quality plastics parts.

Why not find out more about G.E.'s *complete* molding service? G.E. will be glad to work with you on *any phase* of plastics molding. Just write to General Electric Company, Section 110-1A, Chemical Division, Pittsfield, Massachusetts.

You can put your confidence in—

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